AL-FARABI KAZAKH NATIONAL UNIVERSITY

INFORMATION
about publication activity
DEPARTMENT OF CHEMISTRY AND CHEMICAL TECHNOLOGY

№	Наименование публикации	Выходные данные *(doi статьи)*	Аннотация статьи	Ссылка для цитирования *(Ф.И.О., название статьи, название, номер и/или выпуск, том журнала, страницы, doi статьи)*
1.	Enhancing Electrochemical Performance of Stretchable/Flexible Li-Ion Microbatteries by Tuning Microstructured Electrode Dimensions	DOI: 10.1002/admi.202102541	ABSTRACT : Increasing surface area between electrodes and electrolytes drastically has proven to improve electrochemical performances of microbatteries. 3D surface enhancement owing to the design of micropillar electrodes has permitted to fulfill this need while maintaining the same footprint area. Lithium nickel manganese oxide (cathode) and Lithium titanate (anode) micropillars with different sizes are successfully fabricated on aluminum foils by laser ablation technique and are then separated by a polymer electrolyte to form stretchable lithium-ion microbatteries. The electrochemical performance of full batteries composed of different micropillar sizes is studied in detail. The importance of controlling the width of micropillars is demonstrated and correlated with a simple theoretical model	Albertengo, A., Nasreldin, M., Ramuz, M., ...Malchik, F., Djenizian, T.Enhancing Electrochemical Performance of Stretchable/Flexible Li-Ion Microbatteries by Tuning Microstructured Electrode Dimensions //Advanced Materials Interfaces, 2022, 9(13), 2102541

			to optimize the battery properties. It is also shown that areal capacity values can be enhanced by improving the electrode/electrolyte interfaces using a simple treatment under vacuum.	
2.	Application of a conversion electrode based on decomposition derivatives of $Ag_4[Fe(CN)_6]$ for aqueous electrolyte batteries	DOI: 10.1039/d2ra00617k	ABSTRACT : The lack of stable electrode materials for water-based electrolytes due to the intercalation and conversion reaction mechanisms encourage scientists to design new or renovate existing materials with better cyclability, capacity, and cost-effectiveness. $Ag_4[Fe(CN)_6]$ is a material belonging to the Prussian blue family that can be used, as its other family members, as an electrode material with the intercalation/deintercalation reaction or conversion-type mechanism through Ag oxidation/reduction. However, due to the instability of this material in its dry state, it decomposes to AgCN and a Prussian blue residual complex. A possible reason for $Ag_4[Fe(CN)_6]$ decomposition is discussed. Nevertheless, it is shown that the decomposition products of $Ag_4[Fe(CN)_6]$ have electrochemical activity due to the reversible oxidation/reduction of Ag atoms in water-based electrolytes.	Malchik, F., Maldybayev, K., Kan, T., ...Shpigel, N., Djenizian, T.Application of a conversion electrode based on decomposition derivatives of $Ag_4[Fe(CN)_6]$ for aqueous electrolyte batteries//RSC Advances, 2022, 12(16), стр. 9862–9867
3.	Controlled Synthesis of Small Water-Soluble Hybrid Gold Nanoparticles: An Optimized Strategy for Stable Nano-Dispersion and Towards Cellular Uptake	DOI: 10.3389/fmech.2022.824837	ABSTRACT : The development of effective drug delivery systems is one of the major challenges in the fight against cancer. Gold nanoparticles could effectively harness cancer therapies by improving their potency while reducing toxic side effects. In this work, we describe a high-yield one-step synthesis of small water-soluble gold nanoparticles (AuNPs). Efficient purification was monitored, and discrete structure was fully characterized by combining molecular analytical technics (UV-visible and NMR spectroscopies) and solid-state analyses (thermal gravimetric analysis and transmission electron microscopy). These AuNPs have good dispersibility in various biocompatible media and can be used without any additives. Preliminary study with in vitro treatment of IB115 human cancer cells showed massive cellular uptake associated to moderate intrinsic cytotoxicity. The high control of the synthesis and the small size of these AuNPs are offering fine surface properties	Bouyon Yenda, T., Jiguet-Jiglaire, C., Khichane, I., ...Salas, S., Dallemer, F. Controlled Synthesis of Small Water-Soluble Hybrid Gold Nanoparticles: An Optimized Strategy for Stable Nano-Dispersion and Towards Cellular Uptake// Frontiers in Mechanical Engineering, 2022, 8, 824837

			control, crucial for challenging biological nano-dispersion issues. Thus, limitation of the agglomeration of nanoparticles and improvement of interaction with the surface of cell should open new leads for vectorization of drugs or imaging probes for diagnosis.	
4.	TiO_2 nanotube layers decorated by titania nanoparticles as anodes for Li-ion microbatteries	DOI: 10.1016/j.matchemphys.2021.125337	ABSTRACT : In this work, the utilization of TiO_2 nanotube (TNT) layers decorated with TiO_2 nanoparticles (NPs) as anodes in Li-ion microbatteries is reported for the first time. Such TiO_2 NPs decorated TNT layers possess an increased amount of active material and a higher surface area compared with their non-decorated (blank) counterparts. TNT layers decorated with several different amounts of TiO_2 NPs were tested by galvanostatic cycling tests. The capacities of the TiO_2 NPs decorated TNT layer anodes increase with the amount of NPs decoration due to the enhancement of the capacitive effect. Indeed, an areal capacity of ~126 μAh cm^{-2} (vs 88 μAh cm^{-2} for the non-decorated TNT layer) at the 200th cycle has been obtained after optimizing the NPs loading. On the other hand, a too high NPs loading of the TNT layers leads to a reduced areal capacity due to clogging of the nanotube exteriors and a significant decrease in inner diameter of the nanotubes.	Sopha, H., Ghigo, C., Ng, S., ...Djenizian, T., Macak, J.M. TiO_2 nanotube layers decorated by titania nanoparticles as anodes for Li-ion microbatteries //Materials Chemistry and Physics, 2022, 276, 125337
5.	Anodic TiO_2 nanotubes: A promising material for energy conversion and storage	DOI: 10.1016/j.apmt.2022.101613	ABSTRACT : Self-organized TiO_2 nanotube (TNT) layers formed by an anodization process have emerged for the conception of innovative systems in the conversion and storage of energy. Herein, the latest progress in power sources with a remarkable electrochemical performance involving these versatile nanomaterials is reported. Besides the key role of their physico-chemical properties, the significance of interfaces established with other materials to achieve the fabrication of batteries, supercapacitors and fuel cells showing high electrochemical performance is also highlighted. Particularly, recent approaches based on the chemical modifications of the TNTs by doping, solid-state reactions, atomic layer deposition, electrodeposition of metallic nanoparticles and copolymers are presented. In	Galstyan, V., Macak, J.M., Djenizian, T.Anodic TiO_2 nanotubes: A promising material for energy conversion and storage // Applied Materials Today, 2022, 29, 101613

			addition, the strong potential offered by TNT layers for future research works is discussed. This progress report seeks to demonstrate the strong input of anodic TNT layers for developing the next generation of autonomous devices while stimulating more research efforts dedicated to modern technological applications.	
6.	Peculiarities of adsorption of Cr (VI) ions on the surface of Chlorella vulgaris ZBS1 algae cells	DOI: 10.1016/j.heliyon.2022.e10468	ABSTRACT : Cr (VI) compounds are the most dangerous for human health and the environment, therefore, the study of their adsorption features is of great interest. A comprehensive study of the adsorption of Cr (VI) ions on the surface of Chlorella vulgaris ZBS1 algae cells was carried out evaluating the effect of the pH of the medium on the degree of removal of Cr (VI) ions from solutions and on the zeta potential of the cell surface was. The highest values of the degree of removal of Cr (VI) ions equal to 94.6–95.4% are achieved in the pH range of 1–2, being the result of the electrostatic attraction of $HCrO_4^-$ groups to protonated amino groups of the cell surface and the possibility of reducing Cr (VI) ions to Cr (III) in an acidic medium, followed by the formation of Cr (III) ions of coordination bonds with amine and carboxyl groups of algae cells. The adsorption data were processed within the framework of Langmuir, Freundlich, Dubinin-Radushkevich and Temkin models. It was shown that the maximum Langmuir adsorption value was 74.63 mg/g. The values of the adsorption parameters 1/n and K_f in the Freundlich model were equal to 0.713 and 2.82 mg/g. In the Dubinin-Radushkevich model, the maximum adsorption capacity (q_m) and free energy (E) were equal to 39.73 mg/g and 2.604 kJ/mol, respectively. Whereas, according to the Temkin model, the constant A was equal to 18.215 L/mg, and b_T was equal to 0.023 kJ/mol. Taking into account the low values of free energy, it is concluded that adsorption is caused by non-covalent interactions. The study of adsorption kinetics showed that the adsorption of Cr (VI) ions on the surface of Chlorella vulgaris ZBS1 algae cells is described in the framework of the pseudo-second order model. The kinetic behavior of the process is discussed in the framework of the IPDM and ELM models. With increasing temperature, the constant of intraparticle diffusion of Cr (VI) ions decreases,	Tattibayeva, Z., Tazhibayeva, S., Kujawski, W., Zayadan, B., Musabekov, K. Peculiarities of adsorption of Cr (VI) ions on the surface of Chlorella vulgaris ZBS1 algae cells // Heliyon, 2022, 8(9), e10468

			which is explained with increasing of hydrophobic interactions between nonpolar sites of protein macromolecules and polysaccharides in the composition of algae cells. The increase in the adsorption of Cr (VI) ions at pH 8.62 in the temperature range of 298–353 K is justified by the shrinkage of the biosorbent volume, which leads to the blocking of a part of the anionic groups on the surface of algae cells. Therefore, the decrease in the electrostatic repulsion between the negatively charged surface of the adsorbent and Cr (VI) oxyanions is observed.	
7.	Recent demulsification methods of crude oil emulsions – Brief review	DOI: 10.1016/j.petrol.2022.110643	ABSTRACT : The oil industry faces with crude oil emulsions formation issue. It is a common problem for the most of oil-producing countries around the world, including the Republic of Kazakhstan. Mainly, water-in-oil type of emulsions (or reverse emulsions) are formed during oil extraction and transportation. The presence of water in crude oil causes an increase in the cost of oil processing and transportation and consequently increases the cost of oil refinery products. It also induces corrosion of equipment when oil is extracted and transported. In this paper, several major methods of demulsification based on chemical, membrane, electric, magnetic, microwave separation used for the breaking of water-in-oil emulsions in recent years are reviewed and their advantages and disadvantages are highlighted. It is shown that it is important to create cost-efficient and smart demulsifiers of stable oil emulsions including their ecological friendly characteristics. Therefore, the future perspective research areas include the development of sustainable and alternative demulsification methods which are in demands today. In addition, the development of the effective combination of destabilization methods is still relevant today to achieve the synergetic effect in dewatering of highly stable oil emulsions.	Faizullayev, S., Adilbekova, A., Kujawski, W., Mirzaeian, M.Recent demulsification methods of crude oil emulsions – Brief review//Journal of Petroleum Science and Engineering, 2022, 215, 110643
8.	Effect of Heat Treatment on the Structural-Phase State and Properties	DOI: 10.3390/cryst12081056	ABSTRACT : The article describes the effect of heat treatment on the structural-phase state and properties of a multilayer Cr-Al-Co-Y coating obtained by magnetron sputtering. Heat treatment was carried out at 400, 800 and 1000 °C. The study of the	Skakov, M., Zhilkashinova, A., Zhilkashinova, A., ...Agelmenev, M., Ismailova, A. Effect of Heat Treatment on the Structural-

	of a Multilayer Co-Cr-Al-Y Coating		microstructure was carried out by electron microscopy with energy dispersive analysis and powder X-ray diffraction. The surface of the samples was studied by atomic force microscopy. The thickness of the Co-Cr-Al-Y coatings was 1.5–1.7 ± 0.2 μm. The obtained coatings are characterized by a hardness of 4.7–6.4 GPa. A distinctive feature of the layers is the absence of a crystalline structure in some areas of the coating. The main process occurring during the thermal treatment is the formation of a spinel-type phase. For a single-layer sample after heat treatment at 400 °C, it was not possible to fix extraneous reflections except for the reflections of the silicon substrate 111 and 220. For the rest of the samples, the appearance of reflections of a number of phases was noticed, such as: SiO_2, CoO, $AlSi_{0.5}O_{2.5}$ and $CrAl_{0.4}2Si_{1.58}$. An increase in the treatment temperature up to 800 °C did not lead to significant changes. In the case of the multilayer sample, the reflections of various impurity phases disappeared and the Co_3O_4 phase was formed. For samples treated at 1000 °C, the formation of a spinel-type phase (Co_3O_4-$CoCr_2O_4$) was observed in all cases. Data on the structural-phase state and properties of the multilayer Co-Cr-Al-Y coating can be used to predict the nature of such coatings after heat treatment.	Phase State and Properties of a Multilayer Co-Cr-Al-Y Coating // Crystals, 2022, 12(8), 1056
9.	Mini-Hydropower Plant Based on Lenyov Hydrobelt and Volume-Sectional Hydraulic Engine	DOI: 10.3390/pr10020368	ABSTRACT : The use of the energy of small watercourses with the help of small hydropower plants is one of the promising directions for the development of renewable energy. This article presents the designs of two different hydraulic engines, each of which has its own advantage. Therefore, the task of calculating the real parameters of the design of a mini-hydropower plant based on Lenyov hydrobelt has been solved. Theoretical calculations were validated numerically by the finite volume method and computational fluid dynamics modeling; both methods gave similar results. According to the results of calculations, this design based on the Lenyov hydrobelt with the capacity of 16 kW is advisable to place in a river with a flow velocity of at least 4.5 m/s. The article also presents an alternative type of developed mini-hydropower plant,-a volume-sectional hydraulic engine. The proposed rotary-type positive displacement hydraulic engine can operate at low pressure on	Zhilkashinova, A., Abilev, M., Ocheredko, I., ...Nurbayev, M., Azamatov, B. Mini-Hydropower Plant Based on Lenyov Hydrobelt and Volume-Sectional Hydraulic Engine // Processes, 2022, 10(2), 368

			a flat surface. The advantage of the hydraulic engine is the sectional operation of several working chambers. It was established that a high water velocity and a large volume of passing water was not required. The total force acting in the hydraulic engine is 5430.19 N. Due to the use of conical inlet channels, the water flow velocity was increased and the water flow became directional. The frequency of rotation of the hydraulic engine shaft at a river flow velocity of 4 m/s was 60.43 rpm. The received power in these modes was 22.25 kW.	
10.	Miniaturized solid-phase microextraction coupled with gas chromatography-mass spectrometry for determination of endocrine disruptors in drinking water	DOI: 10.1016/j.fochx.2022.100345	ABSTRACT : A simple and rapid method based on miniaturized solid-phase microextraction (mini-SPME) followed by gas chromatography–mass spectrometry was developed to identify eight endocrine disruptors (atrazine, diethylstilbestrol, hexestrol, estrone, estradiol, ethinylestradiol, norgestrel, and megestrel) in drinking water samples. Extraction parameters was optimized and further analyses was performed using them. The optimum temperature for the determination of endocrine disruptors in water was 80 °C; the optimum extraction and preincubation times were 60 and 20 min, respectively. The studied linear range of endocrine disruptors was 10.0–1000 μg mL^{-1}. The limit of detection ranged from 0.020 to 0.087 μg mL^{-1}. The correlation coefficient (r^2) was 0.96–0.99. This research introduces a novel method for detecting analytes at extremely low concentrations, as well as the possibility of combining several detection technologies to give high-accuracy qualitative and quantitative determination of endocrine disruptors in aqueous samples.	Alimzhanova, M., Mamedova, M., Ashimuly, K., Alipuly, A., Adilbekov, Y. Miniaturized solid-phase microextraction coupled with gas chromatography-mass spectrometry for determination of endocrine disruptors in drinking water// Food Chemistry: X, 2022, 14,
11.	Modern Analytical Methods for the Analysis of Pesticides in Grapes: A Review	DOI: 10.3390/foods11111623	ABSTRACT : Currently, research on the determination of pesticides in food products is very popular. Information obtained from research conducted so far mainly concerns the development of a methodology to determine the content of pesticides in food products. However, they do not describe the content of the pesticide used in viticulture in the resulting product. Over the past decade, this study has examined analytical methodologies for assessing pesticide residues in grapes. Scopus, Web of Science, Science Direct, PubMed, and Springer databases were searched for relevant	Syrgabek, Y., Alimzhanova, M. Modern Analytical Methods for the Analysis of Pesticides in Grapes: A Review // Foods, 2022, 11(11), 1623

			publications. The phrases “pesticides” and “grapes” and their combinations were used to search for articles. The titles and annotations of the extracted articles have been read and studied to ensure that they meet the review criteria. The selected articles were used to compile a systematic review based on scientific research and reliable sources. The need to study the detection of pesticide residues in grapes using advanced analytical methods is confirmed by our systematic review. This review also highlights modern methods of sample preparation, such as QuEChERS, SPME, PLE, dLLME, and ADLL-ME, as well as the most used methods of separation and identification of pesticides in grapes. An overview of the countries where residual grape pesticide amounts are most studied is presented, along with the data on commonly used pesticides to control pests and diseases in grape cultivation. Finally, future possibilities and trends in the analysis of pesticide residues in grapes are discussed by various analytical methods.	
12.	Role of carbon material surface functional groups on their interactions with aqueous solutions	DOI: 10.1016/j.jelechem.2022.116707	ABSTRACT : In this work, the fundamental study of the surface functional groups' role of the carbon material based on walnut shells in water solutions was studied. Functional groups (FG) were evaluated by Boehm's titration method, electrochemical impedance spectroscopy, spectrophotometric method, etc. The surface oxygen-containing functional groups (OCFG) was determined quantitatively by Boehm method: C(-C-OH) = 1.15 mmol/g; C(-C[dbnd]O) = 0.87 mmol/g; C(–COOH) = 6.31 mmol/g. By the method of edge angle wetting the influence of OCFG on the formation of a hydrophilic functional layer on the surface of carbon material at different electrolyte media and adhesion works were found. The results of ζ-potential measurements as a function of solution pH allowed us to characterize the surface redox (acid-base) centers of the carbon material. Electrochemical impedance spectroscopy results show that surface OCFGs have a large influence on carbon material capacity characteristics.	Atchabarova, A.A., Abdimomyn, S.K., Abduakhytova, D.A., ...Zlobina, Y.V., Djenizian, T.J. Role of carbon material surface functional groups on their interactions with aqueous solutions // Journal of Electroanalytical Chemistry, 2022, 922,

13.	Phosphogypsum conversion under conditions of SC-CO_2	DOI: 10.1016/j.jcou.2022.102120	ABSTRACT : This article looks into process of supercritical-CO2 phosphogypsum (PG) conversion, which is production residue after making mineral fertilizers by "Kasphosphate"LLC. Nowadays, over 30 million tons of PG have been accumulated in Kazakhstan; its background radiation is low enough to recycle it into valuables such as construction materials, rare earth elements and strontium salts. Complete factorial experiment method was used to describe conversion process; conversion of PG into CaCO3 was optimized using simplex method. Conversion optimization outcomes show possibility of using fewer reagents and shortening conversion process compared to existing technologies. Conversion degree is 87% after 10 min at 33 °C. Conversion was carried out at semi-industrial supercritical equipment with maximum CO2 flow rate up to 5000 g/min and integrated CO2 recirculation system. Characteristics of initial PG samples and conversion products/semi-products were done using X-ray phase analysis, scanning electron microscopy, atomic absorption spectroscopy, ICP-MS, and gravimetric procedure. In order to obtain purer CaCO3 PG was cleared of water-soluble impurities beforehand. As conversion result, finely dispersed CaCO3 and Ca(HCO3)2 as well as Na2SO4 solution were obtained.	Tokpayev, R., Khavaza, T., Ibraimov, Z., ...Abduakhytova, D., Nauryzbayev, M. Phosphogypsum conversion under conditions of SC-CO_2 //Journal of CO2 Utilization, 2022, 63, 102120
14.	Seasonal Variations and Effect of COVID-19 Lockdown Restrictions on the Air Quality in the Cities of Kazakhstan	DOI: 10.1007/s40710-022-00603-w	ABSTRACT: The objective of this study was to investigate the impact of COVID-19 lockdown on different air pollutants in eight cities of Kazakhstan by employing the data from the National Air Quality Monitoring Network. We selected eight cities located in different regions of the country with varied climatic and geographic conditions and emissions sources, providing good conditions for studying the differences in responses of air quality to COVID-19. Due to severe winters, the heating season in Kazakhstan has a significant impact on air quality; therefore, annual winter/spring changes in air quality were also compared. The positive effect of the COVID-19 lockdown (spring 2020) on NO_2 and CO levels was observed in 5 and 3 cities, respectively (out of 8). Total Suspended Particles and SO_2 exhibited a more complicated response to COVID-19 lockdown: cities had a varying effect.	Baimatova, N., Omarova, A., Muratuly, A., ...Bukenov, B., Kerimray, A. Seasonal Variations and Effect of COVID-19 Lockdown Restrictions on the Air Quality in the Cities of Kazakhstan // Environmental Processes, 2022, 9(3), 48

			No impact of lockdown measures was observed in industrial cities (Ust-Kamenegorsk and Karagandy), but seasonal changes were significant. In addition, despite some improvements during the lockdown period, the air quality in seven out of eight cities was still below the safety levels. The atmospheric quality in urban areas of Kazakhstan has not improved significantly due to the lockdown measures. This study underscores the importance of imposing stricter air quality emission control over industrial enterprises and coal-fired power plants.	
15.	Quantification of trace transformation products of rocket fuel unsymmetrical dimethylhydrazine in sand using vacuum-assisted headspace solid-phase microextraction	DOI: 10.1007/s11356-021-17844-1	ABSTRACT: Quantification of unsymmetrical dimethylhydrazine transformation products in solid samples is an important stage in monitoring of environmental pollution caused by heavy rockets launches. The new method for simultaneous quantification of unsymmetrical dimethylhydrazine transformation products in sand samples using vacuum-assisted headspace solid-phase microextraction without addition of water followed by gas chromatography-mass spectrometry is proposed. Decreasing air evacuation time from 120 to 20 s at 23 °C resulted in increased responses of analytes by 25–46% and allowed obtaining similar responses as after evacuation at −30 °C. The best combination of responses of analytes and their relative standard deviations (RSDs) was achieved after air evacuation of a sample (m = 1.00 g) for 20 s at 23 °C, incubation for 30 min at 40 °C, and 30-min extraction at 40 °C by Carboxen/polydimethylsiloxane (Car/PDMS) fiber. The method was validated in terms of linearity (R^2=0.9912–0.9938), limits of detection (0.035 to 3.6 ng g^{-1}), limits of quantification (0.12–12 ng g^{-1}), recovery (84–97% with RSDs 1–11%), repeatability (RSDs 3–9%), and reproducibility (RSDs 7–11%). It has a number of major advantages over existing methods based on headspace solid-phase microextraction—lower detection limits, better accuracy and precision at similar or lower cost of sample preparation. The developed method was successfully applied for studying losses of analytes from open vials with model sand spiked with unsymmetrical dimethylhydrazine transformation products. It can be recommended for analysis of trace	Zhakupbekova, A., Baimatova, N., Psillakis, E., Kenessov, B. Quantification of trace transformation products of rocket fuel unsymmetrical dimethylhydrazine in sand using vacuum-assisted headspace solid-phase microextraction // Environmental Science and Pollution Research, 2022, 29(22), стр. 33645–33656

			concentrations of unsymmetrical dimethylhydrazine transformation products when studying their transformation, migration and distribution in contaminated sand.	
16.	A review on preparation methods and applications of metal–organic framework-based solid-phase microextraction coatings	DOI: 10.1016/j.microc.2021.107147	ABSTRACT : Metal-organic frameworks have drawn increasing attention in the field of solid-phase microextraction due to their unique porous structure. Solid-phase microextraction coatings based on metal–organic frameworks exhibit large surface area (up to 1458 m^2/g), high selectivity, stability (up to 270 extraction/desorption cycles), and extraction efficiency. Although there have been numerous studies on the synthesis of such fibers, many are not commercially available. In situ deposition from solution, chemical vapor deposition, electrodeposition, adhesion, sol-gel, and chemical bonding techniques are discussed among the methods reported to prepare coatings based on a metal–organic framework. Applications of these coatings for the measurement of volatile organic compounds, polycyclic aromatic hydrocarbons, persistent organic pollutants, phenols, and polychlorinated biphenyls are reviewed and critically discussed. The concluding remarks outline technical challenges and future potential of metal–organic framework based solid-phase microextraction fibers.	Omarova, A., Bakaikina, N.V., Muratuly, A., Kazemian, H., Baimatova, N. A review on preparation methods and applications of metal–organic framework-based solid-phase microextraction coatings // Microchemical Journal, 2022, 175, 107147
17.	Quantification of transformation products of rocket fuel unsymmetrical dimethylhydrazine in air using solid-phase microextraction	DOI: 10.1002/jssc.202100684	ABSTRACT: Quantification of unsymmetrical dimethylhydrazine transformation products in ambient air is important for assessing the environmental impact of heavy rocket launches. There are very little data of such analyses, which is mainly caused by the low number of analytes covered by the available analytical methods and their complexity. A simple and cost-efficient method for accurate simultaneous determination of seven unsymmetrical dimethylhydrazine transformation products in air using solid-phase microextraction followed by gas chromatography-mass spectrometry was developed. The method was optimized for air sampling and solid-phase microextraction from 20-mL vials, which allows full automation of analysis. The extraction for 5 min by Carboxen/polydimethylsiloxane fiber from amber vials and desorption for 3 min provided the greatest analytes' responses, lowest relative standard deviations, linear	Bukenov, B., Baimatova, N., Kenessov, B. Quantification of transformation products of rocket fuel unsymmetrical dimethylhydrazine in air using solid-phase microextraction // Journal of Separation Science, 2022, 45(2), стр. 614–622

			calibration (R^2 ≥ 0.99), and limits of detection from 0.12 to 0.5 μg/m^3. Samples with concentrations 500 μg/m^3 can be stored at 21 ± 1°C without substantial losses (1–11%) for up to 24 h, while air samples with concentrations 10 and 50 μg/m^3 stored for up to 24 h can be used for accurate quantification of only two and four out of seven analytes, respectively. The developed method was successfully tested for the analysis of air above real soil samples contaminated with unsymmetrical dimethylhydrazine rocket fuel.	
18.	Modeling the effect of temperature on solid-phase microextraction of volatile organic compounds from air by polydimethylsiloxane coating using finite element analysis	DOI: 10.1016/j.aca.2022.339431	ABSTRACT: A development of analytical methods based on solid-phase microextraction (SPME) is a very time- and labor-consuming task. The finite element methods have found a wide application in SPME modeling for faster and more accurate optimization of analytical methods. In this work, a computational model for predicting the effect of temperature on extraction of VOCs from air onto SPME coating based on polydimethylsiloxane (PDMS) has been developed using COMSOL Multiphysics® (CMP) software. Most suitable methods and models for estimating the diffusion coefficients of analytes in air and coating, and coating-air distribution constants of the analytes at different extraction temperatures were chosen. The Fuller method was chosen for calculating diffusion coefficients of analytes in air due to its simplicity and reliability. Coating-air distribution constants at different temperatures were estimated using van't Hoff equation. A combination of inverse gas chromatography on a capillary column with a similar stationary phase for estimating diffusion coefficients and linear temperature programmed retention indices (LTPRI) for estimating coating-air distribution constants at initial temperature were chosen for modeling purposes because in most cases it provided lowest values of root-mean-square difference from experimental extraction profiles from 125 mL bulb at 25 and 40 °C. The developed model can be recommended for faster and simpler optimization of the methods of air sampling using PDMS SPME fiber. It can also be used for obtaining extraction profiles at fluctuating temperatures.	Kapar, A., Muratuly, A., Orazbayeva, D., ...Bukenov, B., Kenessov, B. Modeling the effect of temperature on solid-phase microextraction of volatile organic compounds from air by polydimethylsiloxane coating using finite element analysis // Analytica Chimica Acta, 2022, 1195, 339431

19.	Catalytic cracking of M-100 fuel oil: relationships between origin process parameters and conversion products	DOI: 10.15826/chimtech.2022.9.3.01	ABSTRACT : The development of technologies for processing oil residues is relevant and promising for Kazakhstan, since the main oil reserves of hydrocarbons in the country are in heavy oils. This paper describes the study of the influence of technological modes on the yield and hydrocarbon composition of products formed because of cracking of commercial fuel oil and fuel oil M-100 in the presence of air in the reactor. For catalysts preparation, natural Taizhuzgen zeolite and Narynkol clay were used. It was found that the introduction of air into the reaction zone, in which oxygen is the initiator of the cracking process, significantly increases the yield of the middle distillate fractions. In the presence of air, the yield of diene and cyclodiene hydrocarbons significantly increases compared to cracking in an inert atmosphere. According to the data of IR spectral analysis of M-100 grade oil fractions, in addition to normal alkanes, the final sample contains a significant amount of olefinic and aromatic hydrocarbons. On the optimal catalyst, owing to oxidative cracking of fuel oil, the following product compositions (in %) were established: Fuel oil M- 100: gas - 0.8, gasoline - 1.1, light gas oil - 85.7, heavy residue - 11.9, loss - 0.5 and total - 100.0%; commodity Fuel oil (M-100): gas - 3.3, gasoline - 8.4, light gas oil - 84.3, heavy residue - 4.0, loss - 0 and total - 100.0%.	Shakiyeva, Tatyana V.[a];Sassykova, Larissa R.[a]Send mail to Sassykova L.R.;Khamlenko, Anastassiya A.[a];Dzhatkambayeva, Ulzhan N.[a];Sassykova, Albina R.[b];Batyrbayeva, Aigul A.[a];Zhaxibayeva, Zhanar M.[c];Ismailova, Akmaral G.[a];Sendilvelan, Subramanian[d] Catalytic cracking of M-100 fuel oil: relationships between origin process parameters and conversion products // *Chimica Techno Acta* , 9, 32022, 20229301
20.	Chromatographic determination of pesticides in soil: Current trends in analysis and sample preparation	DOI: 10.1007/s11356-021-17844-1	ABSTRACT: Quantification of unsymmetrical dimethylhydrazine transformation products in solid samples is an important stage in monitoring of environmental pollution caused by heavy rockets launches. The new method for simultaneous quantification of unsymmetrical dimethylhydrazine transformation products in sand samples using vacuum-assisted headspace solid-phase microextraction without addition of water followed by gas chromatography-mass spectrometry is proposed. Decreasing air evacuation time from 120 to 20 s at 23 °C resulted in increased responses of analytes by 25–46% and allowed obtaining similar responses as after evacuation at −30 °C. The best combination of responses of analytes and their relative standard deviations (RSDs) was achieved after air	Orazbayeva, D., Muratuly, A., Bektassov, M., Zhakupbekova, A., Kenessov, B. Chromatographic determination of pesticides in soil: Current trends in analysis and sample preparation // Trends in Environmental Analytical Chemistry, 2022, 35, e00174

			evacuation of a sample (m = 1.00 g) for 20 s at 23 °C, incubation for 30 min at 40 °C, and 30-min extraction at 40 °C by Carboxen/polydimethylsiloxane (Car/PDMS) fiber. The method was validated in terms of linearity (R^2=0.9912–0.9938), limits of detection (0.035 to 3.6 ng g^{-1}), limits of quantification (0.12–12 ng g^{-1}), recovery (84–97% with RSDs 1–11%), repeatability (RSDs 3–9%), and reproducibility (RSDs 7–11%). It has a number of major advantages over existing methods based on headspace solid-phase microextraction—lower detection limits, better accuracy and precision at similar or lower cost of sample preparation. The developed method was successfully applied for studying losses of analytes from open vials with model sand spiked with unsymmetrical dimethylhydrazine transformation products. It can be recommended for analysis of trace concentrations of unsymmetrical dimethylhydrazine transformation products when studying their transformation, migration and distribution in contaminated sand.	
21.	Preparation and research of cosmetic products based on domestic raw materials	DOI: 10.1016/j.matpr.2022.05.086	ABSTRACT : Emulsions of vegetable oil/water were obtained and the effect of nonionic surfactants on their stability was studied. Triton X-100 and Twin-80 were used as nonionic surfactants. The “lifetime” of oil/water emulsions was determined at various phase ratios such as 7:3, 6:4, 5:5, 4:6, 3:7 and it was revealed that the most stable emulsion is at a ratio of 6:4, which was used for further research. The influence of surfactants on the stability of the selected emulsion is investigated. While the lifetime of the emulsion is about 45–50 min, the mentioned nonionic surfactants increased the lifetime of Twin-80 to 250–350 min, and Triton X-100 to 300–350 min. Concentrations of 10^{-1} and 10^{-2} mol/l of surfactants Twin-80, Triton X-100 showed very good results. On the basis of domestic raw materials, a hand cream was obtained with the replacement of the oil phase of the cosmetic emulsion with sheep fat. The resulted hand cream showed that it complies with the normative indicators of cosmetic creams.	Rakhymbay, A., Yessimova, O., Kumargaliyeva, S., Yessimbekova, R., Toktarbay, Z. Preparation and research of cosmetic products based on domestic raw materials Materials Today: Proceedings, 2022
22.	Development of Electroactive and	DOI: 10.1149/1945-7111/ac6c0c	ABSTRACT :	Bergman, G., Nimkar, A., Saha, A., Malchik,

	Stable Current Collectors for Aqueous Batteries		The need for low-cost, high-safety batteries for large-scale energy storage applications has sparked a surge in research of rechargeable aqueous batteries. While most research efforts are focused on the development of electrolyte formulations and electrode materials, it appears that the current collector impact on the battery performance is frequently overlooked. Even though the current collector is traditionally thought of as an inactive battery component, it is included in the battery energy density calculations, making its activation desirable. Furthermore, poor current collector selection can cause irreversible side reactions, resulting in rapid cell efficiency decay. Herein we propose a new approach to design current collectors that makes use of anodized Ti. The redox-active anodized Ti significantly improves the overall anode capacity and provides effective inhibition of hydrogen formation on the electrified interface. The use of TiO_2particles on an anodized Ti current collector in an aqueous electrolyte solution resulted in capacity of 130 mAh $g^{-1}$and exceptional capacity retention of 99% after 1000 cycles. Although the concept of active current collectors needs to be refined before it can be implemented in commercial cells, our findings indicate that this approach could be useful for improving overall cell performance without requiring significant changes to its configuration.	F., ...Sharon, D., Shpigel, N.Development of Electroactive and Stable Current Collectors for Aqueous Batteries //Journal of the Electrochemical Society, 2022, 169(5), 050516
23.	Erratum: A cost-effective water-in-salt electrolyte enables highly stable operation of a 2.15-V aqueous lithium-ion battery (Cell Reports Physical Science (2022) 3(1), (S2666386421004136), (10.1016/j.xcrp.2021.100688))	DOI: 10.1016/j.xcrp.2022.100817	ABSTRACT : (Cell Reports Physical Science 3, 100688; January 19, 2022) In the originally published version of this article, references were missing from the paper, which led to incorrect citations being included throughout the experimental procedures. The missing references and corrected citations now appear with the paper online. The authors regret this error.	Turgeman, M., Wineman-Fisher, V., Malchik, F., ...Shpigel, N., Aurbach, D.Erratum: A cost-effective water-in-salt electrolyte enables highly stable operation of a 2.15-V aqueous lithium-ion battery (Cell Reports Physical Science (2022) 3(1), (S2666386421004136), (10.1016/j.xcrp.2021.100688))/ / Cell Reports Physical Science, 2022, 3(3), 100817

24.	A cost-effective water-in-salt electrolyte enables highly stable operation of a 2.15-V aqueous lithium-ion battery	DOI: 10.1016/j.xcrp.2021.100688	ABSTRACT : Extensive efforts are currently underway to develop safe and cost-effective electrolytes for large-scale energy storage. In this regard, water-based electrolytes may be an attractive option, but their narrow electrochemical stability window hinders their realization. Although highly concentrated fluorinated electrolytes have been shown to be highly effective in suppression of water splitting, enabling significant widening of the applied potential range, they utilize expensive salts (e.g., lithium bis(trifluoromethane sulfonyl) imide [LiTFSI] or lithium trifluoromethane sulfonate [LiOTf]); hence, they cannot be considered for practical applications. Here, we demonstrate a cost-effective aqueous electrolyte solution combining 14 M LiCl and 4 M CsCl that allows stable operation of a 2.15-V battery comprising a TiO_2 anode and $LiMn_2O_4$ cathode. Addition of CsCl to the electrolyte plays a double role in system stabilization: the added chloride anions interact with the free water molecules, whereas the chaotropic cesium cations adsorb at the electrified interface, preventing hydrogen formation.	Turgeman, M., Wineman-Fisher, V., Malchik, F., ...Shpigel, N., Aurbach, D. A cost-effective water-in-salt electrolyte enables highly stable operation of a 2.15-V aqueous lithium-ion battery // Cell Reports Physical Science, 2022, 3(1), 100688
25.	MODIFICATION OF BENTONITES INOCULATION WITH IRON COMPOUNDS TO AFFORD MAGNETITE CLAYS	DOI: 10.24193/subbchem.2022.2.08	ABSTRACT: Bentonites refer to the class of argilliferous folded silicate rocks, which as a whole have such common characteristics, as dispersion (fragmentation), colloidal properties, propensity to wetness, and adsorption properties. The importance of this paper, as it follows from the conclusion, is connected with the study of synthesizing of magnetic clay composites which have high adsorption capacity, as well as with systematization of their properties. Bentonite magnetic composites are among those which can be stabilized using sodium alginate. Magnetic composites synthesized on the basis of bentonite showed the proportion of magnetite corresponding to the proportion of Fe in the composition of the initial clays. Sodium alginate-based stabilization method is an effective one for bentonite magnetic composites. © 2022, Universitatea Babes-Bolyai, Catedra de Filosofie Sistematica. All rights reserved.	Askapova, B., Musabekov, K. MODIFICATION OF BENTONITES INOCULATION WITH IRON COMPOUNDS TO AFFORD MAGNETITE CLAYS // Studia Universitatis Babes-Bolyai Chemia, 2022, 67(2), стр. 131–141

26.	Toward autonomous wearable triboelectric systems integrated on textiles	DOI 10.1016/j.isci.2022.105264	One of the major requirements of smart textiles is to achieve the integration of an energy source for powering embedded electronic systems. In this context, textile triboelectric nanogenerators (T-TENGs) are particularly well suited to imperceptibly play this role in the core of textiles, making them highly appealing for the development of future autonomous systems. This article reviews the wide range of topics related to T-TENGs technology starting from triboelectric generation (textile device and behavior modeling) up to the complete integration of power transfer (rectifier) circuits on textiles. The modeling part deals with the current mathematical models of the triboelectric charge transfer in order to highlight efficient power transfer circuits. Then the materials and architectures used to fabricate different types of T-TENGs are described. Finally, the methods and technologies to seamlessly integrate the power transfer circuit into textiles are discussed: from realizing electrically conductive tracks through to integrating electronic component on textiles.	Gaubert, V., Vauche, G., Weimmerskirch-Aubatin, J., Corbier, C., Boddaert, X., Delattre, R., Djenizian, T. Toward autonomous wearable triboelectric systems integrated on textiles // iScience. 2022, 25(11), 105264
27.	High conductivity PEDOT:PSS through laser micro-annealing: mechanisms and application	DOI 10.1002/admi.202102541	Increasing surface area between electrodes and electrolytes drastically has proven to improve electrochemical performances of microbatteries. 3D surface enhancement owing to the design of micropillar electrodes has permitted to fulfill this need while maintaining the same footprint area. Lithium nickel manganese oxide (cathode) and Lithium titanate (anode) micropillars with different sizes are successfully fabricated on aluminum foils by laser ablation technique and are then separated by a polymer electrolyte to form stretchable lithium-ion microbatteries. The electrochemical performance of full batteries composed of different micropillar sizes is studied in detail. The importance of controlling the width of micropillars is demonstrated and correlated with a simple theoretical model to optimize the battery properties. It is also shown that areal capacity values can be enhanced by improving the electrode/electrolyte interfaces using a simple treatment under vacuum.	Troughton, J., Peillon, N., Borbely, A., ...Djenizian, T., Ramuz, M. High conductivity PEDOT:PSS through laser micro-annealing: mechanisms and application // Journal of Materials Chemistry C, 2022, 10(43), pp. 16592–16603

28.	Investigation of CO_2Extract of Portulaca oleracea for Antioxidant Activity from Raw Material Cultivated in Kazakhstan	DOI 10.1155/2022/6478977	Medicinal plants remain as an important resource in the fight against many diseases, especially in developing countries. Antioxidants are substances capable of delaying, retarding, and preventing the oxidation of lipids or substances that delay or prevent free radical reactions during lipid oxidation. Natural antioxidants such as ascorbic acid, tocopherol, phenolic compounds, and flavonoids are a safe alternative to chemical antioxidants. In present work, results of antioxidant activity of raw materials from the cultivated plant Portulaca oleracea are presented. The extraction time was optimized to 780 minutes; the yield of extractive substances was 1.25% in the production of CO2 extract under subcritical conditions. For the first time, the antioxidant activity of Portulaca oleracea CO2 extract was determined by the amperometric method. Gas chromatography-mass spectrometry (GC-MS) chemical analysis of Portulaca oleracea CO2 extract dissolved in hexane revealed 37 components, including a complex mixture of aldehydes, alkanes, alkenes, esters, diterpenes, steroids, vitamin E, and carbohydrates. The investigation results showed that the Portulaca oleracea CO2 extract was promising for pharmaceutical, cosmetic, and food industries and had great potential for the prevention and treatment of diseases caused by oxidative stress.	Tleubayeva, M.I., Abdullabekova, R.M., Datkhayev, U., … Alimzhanova, M.B., ...Serikbayeva, E.A., Flisyuk, E.V. Investigation of CO_2Extract of Portulaca oleracea for Antioxidant Activity from Raw Material Cultivated in Kazakhstan // International Journal of Biomaterials, 2022, 2022, 6478977
29.	Natural Material Shungite as Solid-Phase Extraction Sorbent for the Extraction of Red Synthetic Dye Ponceau 4R from Tap Water, Wine, and Juice	DOI 10.1007/s12161-021-02162-6	A natural nanomaterial shungite (NMSh) was used as solid-phase extraction (SPE) absorbent and showed excellent absorption capacity for red synthetic dye. NMSh is a mixture of various carbon allotropes, which is used as an inexpensive and effective sorbent in various scientific and food research around the world. NMSh is not just amorphous carbon, but the mixture of various carbon allotropes; shungite has been categorized as a promising material for the development of nanotechnology, which is of great interest for the development of science and technology. This fact served as the basis for selecting shungite as a material to create sorbents that will be used in the preparation of samples for analysis. For the determination of the red synthetic dye Ponceau 4R in samples of wine and juice, an SPE method with NMSh packed cartridge combined with HPLC–UV detection was developed to determine Ponceau 4R in tap	Alham, A., Ibraimov, A., Alimzhanova, M., Mamedova, M. Natural Material Shungite as Solid-Phase Extraction Sorbent for the Extraction of Red Synthetic Dye Ponceau 4R from Tap Water, Wine, and Juice // Food Analytical Methods, 2022, 15(3), pp. 707–716

			water, wine, and juice samples. Particle size and mass of NMSh sorbent were studied, and a comparison between activated and non-activated NMSh was made for use as a sorbent. Under optimized conditions, the extraction of analyte was 99.3% for wine and 94.3% for juice with relative standard deviations (RSD) during the day equal to 0.18% for juice and 0.15% for wine. The results showed that this method is very sensitive and effective for the determination of food dyes in very complex matrices and in a low concentration. Based on the study was developed the method to determine the dyes in alcoholic and non-alcoholic drinks.	
30.	The influence of fertilisation on the water-salt regime in the conditions of the Mugan-Salyan massif, Azerbaijan	DOI 10.24425/jwld.2022.142330	The article presents research data on the amount of salts in the irrigated soils of the Mughan-Salyan massif, their composition, water-salt regime, and their forecast. It was found that the soils on the territory of the massif were saline to varying degrees. In general, the area of non-saline soils in the massif is 125,650 ha, mildly – 272,070 ha, moderately – 210,560 ha, highly – 125,850 ha, very highly – 109,450 ha and saline soils – 27,520 ha. The absorbed bases in the soils of the massif were studied, and it was determined that they change depending on the amount of salts as follows: in mildly saline soils, Ca – 57.82–68.31%, Mg – 25.26–36.28%, Na – 5.49–6.43%; in moderately saline soils – 56.77–65.76%, 27.03–35.58%, 7.12–7.94%, respectively; in highly saline areas – 54.05–64.75%, 24.94–43.67% and 9.19–14.42%. As you can see, the soils are mildly and moderately saline. The soils in the surveyed areas are saline to varying degrees (i.e., the average value of salts in the 0–100 cm layer of the soil varies between 0.25 and 1.00%). The biological product used in these soils contains a wide range of macro and microelements, humic acids, fulvic acids, amino acids, vitamins and enzymes that do not contain BioEcoGum mineral fertilisers. This biological product was used for the first time and one of the main goals was to study the improvement of water-physical properties of soils after its use. Therefore, the water-salt regime of the soils of the study area was studied on three experimental sites selected for the area, the number of irrigations for different plants, and their norms were determined taking into account the depth of	Mustafayev, M., Tukenova, Z., Alimzhanova, M., Ashimuly, K., Mustafayev, F. The influence of fertilisation on the water-salt regime in the conditions of the Mugan-Salyan massif, Azerbaijan // Journal of Water and Land Development, 2022, (55), pp. 276–285

			groundwater in the soils and shown in tabular form. They are widely used in farms and these regions, taking into account the proposed irrigation norms and their quantity.	
31.	Nanostructured TiO2 as anode material for magnesium-ion batteries	DOI 10.1007/s10008-022-05307-7	The nanotubular structure of titanium dioxide (TiO_2) is most suitable for creating high-performance energy storage and conversion devices. This paper reports on the synthesis of an array of nanotubes (NTs) from TiO_2 by electrochemical anodization of titanium sheets using electrolytes based on fluorine and glycerol. The results of SEM and X-ray spectral analysis of the obtained material revealed the anatase phase of TiO_2 nanotubes with an inner diameter of 96–150 nm and a length of 0.6 ± 0.1 μm. The electrochemical behavior of the resulting electrode was studied in a solution of $Mg(TFSI)_2$ based on ethylene carbonate/dimethyl carbonate (1/1). From the cyclic voltammograms, the diffusion coefficient and rate constant were determined to be $1.51 \cdot 10^{-10}$ $cm^2 \cdot s^{-1}$, k = $1.55 \cdot 10^{-10}$ $cm \cdot s^{-1}$ (reduction), respectively. The value of the Coulomb efficiency at low discharge current is higher (88%) than at high discharge current (56%). At a high discharge current (1C), it is noticeable that the charge capacity in the cathodic process is much higher than in the anodic process.	Jumanova, R., Rakhymbay, G., Abildina, A., Avchukir, Kh., Bakhytzhan, E., Vacandio, F., Argimbayeva, A. Nanostructured TiO2 as anode material for magnesium-ion batteries // Journal of Solid State Electrochemistry, 2023, 27(1), pp. 223–233
32.	A cost-effective water-in-salt electrolyte enables highly stable operation of a 2.15-V aqueous lithium-ion battery	DOI 10.1016/j.xcrp.2021.100688	Extensive efforts are currently underway to develop safe and cost-effective electrolytes for large-scale energy storage. In this regard, water-based electrolytes may be an attractive option, but their narrow electrochemical stability window hinders their realization. Although highly concentrated fluorinated electrolytes have been shown to be highly effective in suppression of water splitting, enabling significant widening of the applied potential range, they utilize expensive salts (e.g., lithium bis(trifluoromethane sulfonyl) imide [LiTFSI] or lithium trifluoromethane sulfonate [LiOTf]); hence, they cannot be considered for practical applications. Here, we demonstrate a cost-effective aqueous electrolyte solution combining 14 M LiCl and 4 M CsCl that allows stable operation of a 2.15-V battery comprising a TiO_2 anode and $LiMn_2O_4$ cathode. Addition of CsCl to the electrolyte plays a double role in system stabilization: the added chloride anions interact with the free water molecules, whereas the	Turgeman, M., Wineman-Fisher, V., Malchik, F., ...Shpigel, N., Aurbach, D. A cost-effective water-in-salt electrolyte enables highly stable operation of a 2.15-V aqueous lithium-ion battery // Cell Reports Physical Science, 2022, 3(1), 100688

			chaotropic cesium cations adsorb at the electrified interface, preventing hydrogen formation.	
33.	Unique Mechanisms of Ion Storage in Polyaniline Electrodes for Pseudocapacitive Energy Storage Devices Unraveled by EQCM-D Analysis	DOI 10.1021/acsami.2c13771	The optimal performance of organic electrodes for aqueous batteries requires their full compatibility with selected electrolyte solutions. Electrode materials having 1-3-dimensional structures of variable rigidity possess a confined space in their structure filled with water and electrolyte solutions. Depending on the rigidity and confined space geometry, insertion and extraction of ions into electrode structures are often coupled with incorporation/withdrawal of water molecules. Aside from the scientific interest in understanding the charging mechanism of such systems, co-insertion of solvent molecules affects strongly the charge storage capability of the electrodes for energy storage devices. We present herein in situ electrochemical quartz crystal microbalance with dissipation monitoring (EQCM-D) investigations of polyaniline (PANI) electrodes operating in various aqueous Na+-containing electrolytes, namely, Na2SO4, NaClO4, NaBF4, and NaPF6. Careful analysis of the EQCM-D results provides a dynamic snapshot of the mixed anionic/protonic fluxes and the accompanying water molecules' insertion/extraction to/from the PANI electrodes. Based on our observations, it was found that the charging mechanism, as well as the capacity values, strictly depends on the electrolyte pH, the chaotropic/kosmotropic character of the anionic dopants, and the amount of the extracted water molecules. This study demonstrates the effectiveness of analysis by EQCM-D in selecting electrolytes for batteries comprising organic electrodes.	Turgeman, M., Bergman, G., Nimkar, A., Malchik, F., ...Shpigel, N., Aurbach, D. Unique Mechanisms of Ion Storage in Polyaniline Electrodes for Pseudocapacitive Energy Storage Devices Unraveled by EQCM-D Analysis // ACS Applied Materials and Interfaces, 2022, 14(41), pp. 47066–47074
34.	What about Manganese? Toward Rocking Chair Aqueous Mn-Ion Batteries	DOI 10.1021/acsenergylett.2c02242	The emerging interest in aqueous rechargeable batteries has led to significant progress in the development of next-generation electrolytes and electrode materials enabling reversible and stable insertion of various multivalent ions into the electrode's bulk. Yet, despite its abundance, high salt solubility, and small ionic radius, the use of manganese ions for energy storage purposes has not received sufficient attention. Herein, we present the use of Mo_6S_8(Chevrel phase) as an anode for Mn^{2+}insertion. By careful optimization	Nimkar, A., Chae, M.S., Wee, S., Malchik, F.,...Shpigel, N., Mandler, D. What about Manganese? Toward Rocking Chair Aqueous Mn-Ion Batteries // ACS Energy Letters, 2022, 7(12), pp. 4161–4167

			of the electrolyte solution, high-capacity values exceeding 90 mAh/g and long-term stability (more than 1500 cycles) have been obtained. Based on in situ XRD analysis, the charging mechanism and the associated structural changes occurring during Mn^{2+}insertion have been carefully studied. Finally, we demonstrate for the first time a rocking chair aqueous Mn-ion battery comprising a Chevrel anode and NiHCF cathode.	
35.	Simulation of Intercalation Processes in Poorly Conductive Materials	DOI 10.1149/2162-8777/ac844d	To determine the impact of the electrode composite parameters of metal-ion intercalation into host materials with poor conductivity, the processes were simulated with varying possible values of parameters. A physical model is proposed for the intercalation into an active material particle that has point contacts with an electronic conductor, considering the change in phase conductivity during intercalation. The basis of the model are the processes of electron migration through the phase of the poorly conductive material to its interface with the electrolyte, intercalation of cations from the electrolyte into the cathode material, formation of intercalated phase and its subsequent diffusive propagation into the material bulk. The finite element method implemented in COMSOL Multiphysics software was used for numerical simulation. The effect of electrical conductivity, kinetic parameters at the interfaces, mass transfer of intercalated atoms in the host material and the number of electronic contacts with cathode particle were simulated. The strong dependence of the kinetics of the de/intercalation process on the number of electronic contacts on the particle is discovered. It is shown that starting from certain values of the conductivity of the intercalation material, the reaction can be described by the equipotential surface approximation.	Zhigalenok, Y., Kokhmetova, S., Malchik, F., ...Galeyeva, A., Kurbatov, A. Simulation of Intercalation Processes in Poorly Conductive Materials // ECS Journal of Solid State Science and Technology, 2022, 11(9), 093004
36.	INVESTIGATION OF THE FUNCTIONAL LAYER FORMATION ON THE SURFACE OF CARBON MATERIAL	DOI 10.24193/subbchem.2022.4.10	In this study, a comparison of walnut-based carbon materials (CM) obtained by hydrothermal carbonization (HTC) and HTC in combination with steam gas activation (SGA) was carried out. In order to study the effect of steam activation on the functional layer formation, the obtained materials were studied by SEM, nitrogen adsorption/desorption by Brunauer-Emmett-Teller (BET) method, Raman spectroscopy, X-ray diffraction spectroscopy (XRD), X-ray fluorescence elemental	S. Abdimomyn, A. Atchabarova*, D. Abduakhytova, R. Tokpayev, K. Kishibayev, T. Khavaza, A. Kurbatov, G. L. Turdean, M. Nauryzbayev INVESTIGATION OF THE FUNCTIONAL LAYER

			analysis (XRF). Functional groups (FG) were evaluated qualitatively and quantitatively by Fourier transform infrared spectroscopy (FTIR), acetone extract analysis of CM by gas chromatography-mass spectrometry (GC-MS), and potentiometrically Boehm titration. The described mechanism of the influence of the base nature on the surface functionality correlates well with the results of the powder addition method. The HTC or HTC+SGA treatment provides a wide range of possibilities for further controlled modification of the carbon sorbent surface for specific adsorption purposes.	FORMATION ON THE SURFACE OF CARBON MATERIAL // Studia Universitatis Babes-Bolyai Chemia, 2022, 67(4), pp. 151–167
37.	MOF-199-based coatings as SPME fiber for measurement of volatile organic compounds in air samples: Optimization of in situ deposition parameters	DOI 10.1016/j.microc.2022.108263	In this study MOF-199-based solid-phase microextraction coating was synthesized using an in situ solvothermal method on a stainless steel substrate. The effects of solvent, metal salt, chemical modulator, and batch composition on the physicochemical characteristics of the MOF-199 coating were studied. The thickness of the MOF-199 coating increased by 18% when 15.2 mmol of acetic acid was used as an additive. Using 99.9% butanol as the solvent improved homogeneity (smaller crystallite size) of the MOF coating and decreased coating thickness by 7.5 times compared to those of 75% ethanol. Using $Cu(OAc)_2 \cdot H_2O$ as the metal precursor did not lead to the growth of the MOF-199 layer on stainless steel cores. Whilst the use of $Cu(NO_3)_2 \cdot 3H_2O$ allowed to obtain 6-, 21-, 34-, 62-, 94- and 105 µm MOF-199 SPME coatings. Responses of 7 volatile organic compounds by 34-µm and 62-µm MOF-199-based fibers were 1.2–8.5 times higher than those of commercial PDMS/DVB. The method developed for the quantification of BTEX in the air was characterized by high linearity (R^2 = 0.9909–0.9993), low limits of detection (0.03–0.09 µg/m^3), and quantification (0.09–0.31 µg/m^3), high repeatability (1.0–6.4%) and reproducibility (4.5–8.0%). The spike recoveries ranged from 73% to 108%.	Omarova, A., Baimatova, N., Kazemian, H. MOF-199-based coatings as SPME fiber for measurement of volatile organic compounds in air samples: Optimization of in situ deposition parameters // Microchemical Journal, 2023, 185, 108263
38.	Recent Advances in the Preparation of Barium Sulfate Nanoparticles: A Mini-Review	*ChemEngineering (2022)*, *6*(2), 30. doi.org/10.3390/chemengineering6020030	The potential for barium sulphate nanoparticles to be used in a variety of important fields has sparked a lot of attention. Methods for obtaining this material by milling (top-down approach) are not very popular due to the difficulty of controlling the size and shape of particles, as well as changes in their physicochemical properties during milling. More	Ketegenov, T., Kamunur, K., Batkal, A., Gani, D., & Nadirov, R. (2022). Recent Advances in the Preparation of Barium Sulfate Nanoparticles: A Mini-

			promising is the bottom-up approach, which is the interaction of Ba^{2+} and SO_4^{2-} ions in a liquid environment. Direct precipitation is the simplest method; however, it does not allow control of the particle size. Microemulsions, microreactors membrane dispersion, as well as spinning disc reactors are used to overcome drawbacks of direct precipitation and allow control of particle size and shape. This is ensured mainly by intensive controlled micromixing of the precursors with concentrations close to saturated ones. The present review focuses on recent advances in the production of barium sulfate nanoparticles using various approaches, as well as their advantages and limitations. The issues of scaling up the techniques are also considered, and promising methods for obtaining $BaSO_4$ nanoparticles are also discussed	Review. *ChemEngineering*, *6*(2), 30. doi.org/10.3390/chemengineering6020030
39.	Enhancing Synthetic Zinc Ferrite Hydrochloric Acid Leaching by Using Isopropanol as a Solvent.	*Mining, Metallurgy & Exploration (2022)*, *39*(4), 1743-1751. Doi.org/10.1007/s42461-022-00648-3	Zinc ferrite ($ZnFe_2O_4$) is a by-product of non-ferrous metal production and is considered a promising source of raw zinc. The most efficient way to extract zinc from its ferrite is via acidic extraction, specifically leaching by hydrochloric acid. A comparative study of synthetic zinc ferrite hydrochloric acid leaching in isopropanol, aqueous, and the mixed solvent was performed. Zinc ferrite was obtained by sintering a zinc and iron (III) oxide mixture. Crushed samples were subjected to leaching in 1 M HCl at 323, 333, and 353 K and pulp density of 1 g/100 Ml. The dissolution of zinc and iron into solution in organic media reached 77% at 353 K, while in an aqueous environment this value was 65%. The activation energy of 70.0 Kj/mol was found for the leaching process in an isopropanol environment, which is lower than that in an aqueous solution by 15%. The more efficient leaching effect of isopropanol is attributed to the lower dielectric constant of the alcohol which increases the affinity of chloride anions for zinc and iron cations at leaching.	Nadirov, R., & Karamyrzayev, G. (2022). Enhancing Synthetic Zinc Ferrite Hydrochloric Acid Leaching by Using Isopropanol as a Solvent. *Mining, Metallurgy & Exploration*, *39*(4), 1743-1751. Doi.org/10.1007/s42461-022-00648-3

40.	Selective Ozone-Assisted Acid Leaching of Copper from Copper Smelter Slag by Using Isopropanol as a Solvent	*Minerals (2022)*, *12*(8), 1047. doi.org/10.3390/min12081047	Copper content in copper smelter slag exceeds that in copper ores, which has attracted increasing interest to recover copper from this by-product of pyrometallurgical copper production. The isopropanol-sulfuric acid-ozone system has been tested under different conditions to extract this metal from copper smelter slag containing chalcopyrite as a copper mineral. Isopropanol as a solvent played a key role in increasing the copper recovery to 87% after 5 h of leaching, while the use of an aqueous solution of sulfuric acid allowed only 13% of copper to be recovered. Iron extraction under these conditions was only 10%. The role of ozone was spectroscopically proven to oxidize ferrous ions to form ferric ions, which are effective oxidizers of chalcopyrite. The presence of copper in solution in the form of cuprous (Cu^{+}) ions was proven electrochemically. The increased copper extraction in the solution was caused by the stabilization of cuprous ions by isopropanol. The limiting stage of the process was the chemical reaction on the chalcopyrite surface with the activation energy of 73.4 Kj mol^{-1}.	Nadirov, R., & Karamyrzayev, G. (2022). Selective Ozone-Assisted Acid Leaching of Copper from Copper Smelter Slag by Using Isopropanol as a Solvent. *Minerals*, *12*(8), 1047. doi.org/10.3390/min12081047
41.	Freshly Milled Quartz Particles Obtained from River Sand as an Efficient Natural Demulsifier for Crude Oil Emulsions	*Processes (2022)*, *10*(5), 811. doi.org/10.3390/pr10050811	Saline water necessarily contained in crude oil forms complex and stable water-in-oil (w/o) emulsions with oil. Due to the negative impact of this emulsion on the oil's transportation and refining, special materials are added to help break the emulsion and separate water. Herein, a comparative study of the demulsifying ability concerning w/o emulsion of the original and freshly milled quartz (FMQ) particles isolated from river sand was carried out. The effect of quartz with a mesh size of 75 μm on reducing emulsion stability was investigated using rheological measurements, interfacial tension measurements, demulsification tests, as well as routine methods for characterizing solid and liquid materials. With the addition of 3 wt% FMQ, 97% demulsification efficiency was achieved after 100 min of settling, against 140 min for the original quartz. The role of milling quartz is to increase the ability of water to adhere and thus locally increase the Ph value; this results in a reduction in the stability of the emulsion and its destruction. The prolonging effect of quartz milling lasted about 2.5–3.0 h, after which the	Nadirov, K., Zhantasov, M., Nadirova, Z., Otarbaev, N., Bimbetova, G., & Nadirov, R. (2022). Freshly Milled Quartz Particles Obtained from River Sand as an Efficient Natural Demulsifier for Crude Oil Emulsions. *Processes*, *10*(5), 811. doi.org/10.3390/pr10050811

			demulsifying ability of milled quartz became comparable to that of the starting material.	
42.	Dissolution of Chalcopyrite in Presence of Chelating Agent and Hydrogen Peroxide	*Transactions of the Indian Institute of Metals (2022)*, *75*(1), 273-280. Doi.org/10.1007/s12666-021-02426-z	Chelating agents (e.g., EDTA, titriplex III, etc.) are very important salts as they can take a complex form with metal ions. This study investigated usage of titriplex III in presence of hydrogen peroxide for metal extraction from chalcopyrite concentrate under various conditions such as conventional leaching, mechanical activation and ultrasound leaching. The results show that both titriplex and hydrogen peroxide are required for metal extraction from chalcopyrite concentrate. However, mechanical activation is an important parameter for increasing metal extraction, so that copper extraction increases to 83% from 47% after 30 min of grinding chalcopyrite by a high-energy grinding system. Metal extraction efficiency is improved by application of ultrasound to the leaching process. It is possible to obtain copper and iron extraction as 93% and 65%, respectively, under the following leaching conditions: mechanical activation time of 30 min, titriplex concentration of 100 g L^{-1}, H_2O_2 concentration of 2 mol L^{-1}, ultrasound power of 10%, leaching time of 90 min, leaching temperature of 45 °C and liquid–solid ratio of 25 Ml g^{-1}.	Turan, M. D., Silva, J. P., Sarı, Z. A., Nadirov, R., & Toro, N. (2022). Dissolution of Chalcopyrite in Presence of Chelating Agent and Hydrogen Peroxide. *Transactions of the Indian Institute of Metals*, *75*(1), 273-280. Doi.org/10.1007/s12666-021-02426-z
43.	Selective Hydrochloric Acid Leaching of Zinc, Lead and Silver from Mechanically Activated Zinc Plant Residue	*Russian Journal of Non-Ferrous Metals (2022), 63(5)*, 490-499. Doi.org/10.3103/S1067821222050108	Abstract—A solid waste from zinc production, zinc plant residue (ZPR) is a valuable resource for the recovery of zinc (Zn), lead (Pb), and silver (Ag). However, the ferritic structure of ZPR makes it difficult to leach these metals. Here, in order to increase the reactivity of the ZPR, mechanical activation using a high-energy ball mill was used. The sample mechanically activated for 15 min was subjected to two-stage leaching with the hydrochloric acid (HCl) solution. At the 1st stage, 74% of Zn was recovered from mechanically activated ZPR sample into the solution under the following conditions: 1 M HCl, 120 min leaching duration, liquid-to-solid ratio (L : S) of 4, the temperature of 25°C, and a rotation speed of 600 rpm. At the 2nd stage, 56% of Pb and 53% of Ag were recovered from the leaching residue, under the following optimized conditions: 8 M HCl,	M. Deniz Turan, Shoeleh Assemi, Rashid K. Nadirov, Galymzhan A. Karamyrzayev, Omirserik Baigenzhenov, Norman Toro (2022). Selective Hydrochloric Acid Leaching of Zinc, Lead and Silver from Mechanically Activated Zinc Plant Residue. *Russian Journal of Non-Ferrous Metals, 63(5),* 490-499. Doi.org/10.3103/S1067821222050108

			120 min leaching duration, liquid-to-solid ratio (L : S) of 20, the temperature of 25°C, and a rotation speed of 600 rpm. Conceptual flow-diagram of the zinc, lead and silver selective recovery from ZPR is proposed herein.	
44.	Catalytic Decomposition of Methane to Hydrogen over Al_2O_3Supported Mono- and Bimetallic Catalysts	*Bulletin of Chemical Reaction Engineering & Catalysis*, 17 (1), 1-12 (doi:10.9767/bcrec.17.1.12174.1-12)	This article discusses the decomposition of methane in the temperature range 550-800°C on low-percentage monometallic (Ni/γ-Al_2O_3, Co/γ-Al_2O_3) and bimetallic (Ni-Co/γ-Al_2O_3) catalysts. It is shown that the bimetallic cata-lyst is more active in the decomposition of methane to hydrogen than monometallic ones. At a reaction tempera-ture of 600°C, the highest methane conversion is 81%, and the highest hydrogen yield of 51% is formed on Ni-Co/γ-Al_2O_3. A complex of physicochemical methods (Scanning Electron Microscope (SEM), X-ray Diffraction (XRD), Temperature Programmed Reduction (TPR-H2), etc.) established that the addition of cobalt oxide to the composi-tion of Ni/γ-Al_2O_3leads to the formation of surface bimetallic Ni-Co alloys, while the dispersion of particles 27haracte-es and the reducibility of the catalyst is facilitated, which provides an increase in the concentration of metal parti-cles – active centers, which can be the reason for an increase in the catalytic properties of a bimetallic catalyst in comparison with monometallic ones. © 2022 Diponegoro University. All rights reserved.	Ergazieva, G. E., Makayeva, N., Shaimerden, Z., Soloviev, S. O., Telbayeva, M., Akkazin, E., Ahmetova, F. (2022). Catalytic Decomposition of Methane to Hydrogen over Al2O3 Supported Mono- and Bimetallic Catalysts. *Bulletin of Chemical Reaction Engineering & Catalysis*, 17 (1), 1-12 (doi:10.9767/bcrec.17.1.12174.1-12)
45.	Electrochemical synthesis of Fe-containing composite for decomposition of methane into Cox-free hydrogen and nano-carbon	*Chem. Pap.* (2022). https://doi.org/10.1007/s11696-022-02420-9	Decomposition of methane is the most efficient method for obtaining pure hydrogen. As catalysts for decomposition of methane, in this work, Ni-foam and Ni–Fe composites obtained by the electrochemical method were used for the first time. Thin iron films were electrochemically grown by potential cycling on the Ni-foam surface. The obtained catalysts were tested for decomposition of methane in the temperature range of 650–850 °C and characterized using XRD, RAMAN, SEM, TGA/DTA, H_2-TPR and BET analysis of specific surface area and pore size. The effect of cycles (75, 150, and 250) of iron deposition on Ni-foam on its activity in methane decomposition was studied. It has been determined that the highest catalytic activity is observed for the composite, where the iron deposition cycle on nickel foam is	Yergaziyeva, G., Makayeva, N., Abdisattar, A. *et al.* Electrochemical synthesis of Fe-containing composite for decomposition of methane into Cox-free hydrogen and nano-carbon. *Chem. Pap.* (2022). https://doi.org/10.1007/s11696-022-02420-9

			150. The Ni-Fe150 catalyst showed an initial methane conversion of 91% at a temperature of 850 °C, which increased from 60 min to 96.7% and from 180 min to 98.6%, and was stable for 540 min, while the hydrogen yield was 76%. It has been stated that graphite-like carbon is formed on all catalysts, and the largest amount (32%) is formed on Ni-Fe150. The data obtained in the work indicate that the increase in the activity of Ni-Fe150 in the decomposition of methane is associated with the formation of a Ni–Fe alloy and an increase in the reducibility of iron cations in the composition of the Ni–Fe alloy. In addition, the formation of graphite-like carbon with a high defectiveness on the surface of the Ni-Fe150 catalyst promotes the decomposition of methane in areas not covered with carbon.	
46.	Comparative Study of Physicochemical Characteristics and Catalytic Activity of Copper Oxide over Synthetic Silicon Oxide and Silicon Oxide from Rice Husk in Non-Oxidative Dehydrogenation of Ethanol	ChemEngineering 2022, 6(5), 74; https://doi.org/10.3390/chemengineering6050074	The article presents the results of comparative research on the physicochemical characteristics and catalytic activity of copper oxide supported on synthetic SiO2 and SiO2 (RH) from rice husk. SiO2 (RH) is more hydrophobic compared to SiO2, which leads to the concentration of copper oxide on its surface in the form of a “crust”, which is very important in the synthesis of low-percentage catalysts. According to SEM, XRD, and TPR-H2, the use of SiO2 (RH) as a carrier leads to an increase in the dispersion of copper oxide particles, which is the active center of ethanol dehydrogenation.	Mambetova, M.; Yergaziyeva, G.; Dossumov, K.; Askaruly, K.; Azat, S.; Bexeitova, K.; Anissova, M.; Baizhomartov, B. Comparative Study of Physicochemical Characteristics and Catalytic Activity of Copper Oxide over Synthetic Silicon Oxide and Silicon Oxide from Rice Husk in Non-Oxidative Dehydrogenation of Ethanol. ChemEngineering 2022, 6, 74. https://doi.org/10.3390/chemengineering6050074
47.	Effect of Preparation Method on the Activity of Fe2O3-NiO/γ-Al2O3 Catalyst in Decomposition of Methane	(2022) Eurasian Chemico-Technological Journal, 24 (3), pp. 221 – 227. DOI 10.18321/ectj1435	The effect of method preparation on the activity of Fe2O3-NiO/γ-Al2O3 catalyst was investigated in process decomposition of methane. Fe2O3-NiO/γ-Al2O3 catalyst was prepared by impregnation and solution combustion methods. The samples were characterized by X-ray phase analysis (XRD), temperature-programmed hydrogen reduction (TPR-H2), BET and Raman spectroscopy. It has been shown that the method of preparation plays an important role in	Yergaziyeva G., Makayeva N., Anissova M., Dossumov K., Mambetova M., Shaimerden Z., Niyazbaeva A., Akkazin E. Effect of Preparation Method on the Activity of Fe2O3-NiO/γ-Al2O3 Catalyst in Decomposition of Methane

			regulating the textural and morphological properties of catalysts and provides a difference in their catalytic activity. The synthesis of the Fe2O3-NiO/γ-Al2O3 catalyst by the solution combustion method, in comparison with the capillary impregnation method, leads to the formation of a large amount of FeNi and FeAl2O4 solid solutions, which ensured good catalytic activity at high temperatures. The Fe2O3-NiO/γ-Al2O3 catalyst synthesized by the solution combustion method demonstrated good activity with a hydrogen yield of 52% within 150 min of the reaction without any deactivation. According to the results of Raman spectroscopy, graphene-like carbon was obtained on the surface of the catalysts. On the catalyst of Fe2O3-NiO/γ-Al2O3 (CI) synthesized by capillary impregnation, 4–5 layer graphene on Fe2O3-NiO/γ-Al2O3 (SC)-6-7 layer graphene is formed	(2022) Eurasian Chemico-Technological Journal, 24 (3), pp. 221 – 227. DOI: 10.18321/ectj1435
48.	Test trials of a process to produce briquettes from coal mining waste	DOI: 10.17580/gzh.2021.02.12	At the present time, coal production wastes up to 2 % of fine fraction, which has adverse impact on the environment. On the other hand, coal fines can be a feedstock to obtain different products of chemical processing—benzines, oils, briquettes, etc. For this reason, it is necessary to develop dedicated technologies to utilize fine waste in manufacture of products having high added value. The experimental results demonstrate usability of wheat bran as a binder in coal waste briquetting. It is found how the binder and the briquetting conditions influence the physical and mechanical properties and combustion characteristics of coal briquettes. The optimized coal briquetting conditions are: carbonization of feedstock, use of binder in quantity of 25–30 mass%, briquetting pressure of 4 Mpa. Thus, the authors have analyzed the influence of the briquetting conditions on the properties of coal briquettes, and have tested the earlier developed approaches to transformation of Oi-Karagai coal fines into a target product of high added value.	Kamunur, K., Ketegenov, T., Kalugin, S., Karagulanova, A., Zhaksibaev, M., The role of the alkaline promoter on the formation of strength and burning of coal briquettes // South African Journal of Chemical Engineering, 2022, 42, P. 156–161 https://doi.org/10.1016/j.sajce.2022.08.009
49.	The role of the alkaline promoter on the formation of strength and burning of coal briquettes	https://doi.org/10.1016/j.sajce.2022.08.009	Coal fines formed in the process of coal mining are of no commercial value and accumulate in dumps, harming the environment. At the same time, they can be used as a source of low-smoke fuel used by the population for domestic needs. To create such a product, it is necessary to solve many	K. Kamunur, T. Ketegenov, S. Kalugin, A. Karagulanova, M. Zhaksibaev, The role of the alkaline promoter on the formation of strength and

			technical problems related to selecting binders for coal, providing mechanical strength, and initiating the combustion process of coal briquettes. This study presents the results of obtaining briquette fuel from fine particles of brown coal. Low-temperature pyrolysis determined the qualitative and quantitative composition of volatile components and proposed a mechanism for forming a porous structure of coal after thermal exposure. A composition of a mixture of caustic soda and grain processing waste was used as a binder for the production of briquettes. The mechanism of the formation of adhesive properties of the binder material is explained, and the optimal concentration of sodium hydroxide in it is determined. The positive role of caustic soda as a catalyst for the burning of briquettes is shown, and the activation energy of the burning process is calculated.	burning of coal briquettes, South African Journal of Chemical Engineering, Volume 42, 2022, Pages 156-161, ISSN 1026-9185, https://doi.org/10.1016/j.sajce.2022.08.009.
50.	Mechanisms for Ultrafine Copper Powders Electrolytes Production in the Presence of Titanium Ions	https://doi.org/10.4152/pea.2022400505	Copper (Cu) powder production, in a sulfuric acid (H_2SO_4) solution with titanium (Ti) ions, was studied by electrolysis, using Cu anodes. It was empirically proven that this process occurs by three different stage-based mechanisms that depend on the electrolyte composition and electrolysis conditions. The first mechanism occurs in a H_2SO_4 solution with Cu^{2+} ions and Ti^{4+} (tetravalent ions). Cu^{2+} are cathodically reduced, forming Cu powder (CP), since the process occurs at current densities (J) lower than the limiting one. So, part of the current that would be consumed by the hydrogen ions (H^+) reduction reaction is spent to reduce Ti^{4+}, which results in Ti^{3+} (trivalent ions). These, in the cathode space, reduce Cu^{2+}, which, simultaneously, regenerates Ti^{4+}. Then, these diffuse and are again reduced at the cathode, and Ti^{3+} are formed, reducing Cu^{2+}, in a cyclic process that further increases CP production current efficiency (CE) at the near-cathode space, forming more dispersed particles. The second mechanism occurs in a H_2SO_4 solution with only Ti^{4+}. During the electrochemical circuit current flow, the Cu anode is oxidized to form Cu^{2+}, and Ti^{4+} are reduced to Ti^{3+}, on the cathode surface. Then, Cu^{2+} and Ti^{3+}, by diffusing the solution volume and meeting in the inter-electrode space, chemically interact with each other, due to the red-ox (reduction-oxidation) potential difference, forming a dispersed CP and	Bayeshov, A., Bayeshova, A., Abduvaliyeva, U., Buketova, A. Portugaliae Electrochimica Acta, 2022, 40(5), стр. 373–381 https://doi.org/10.4152/pea.2022400505

			Ti^{4+}. These diffuse one more time, and are again reduced to Ti^{3+}. These processes are cyclically repeated, i.e., Ti^{4+} work as catalyst. The third mechanism takes place in H_2SO_4 with Ti^{3+}. When the current flows through the electrolyte, the Cu anode is oxidized, forming Cu^{2+}, which are immediately reduced in the anode by Ti^{3+}, producing CP. Ti^{4+} are formed due to the red-ox reaction diffusion to the cathode, being reduced to Ti^{3+} on its surface, which again interact with Cu, producing CP on the anode. Since, in all mechanisms (except the first), CP is not directly produced on The cathode surface, but in the inter-electrode space, further growth of Cu particles does not occur. Thus, CP particles of spherical shape, with sizes from 0.01 to 0.1 µm, are formed, with a CE from 95.2 to 99.1%, under optimal conditions.	
51.	Recovery of "Hard-to-Recover" Selenate Ions in Sulfuric Acid Solutions during Polarization of Titanium Electrodes by Industrial Alternating Current	https://doi.org/10.3390/inorganics10060072	The article is devoted to the study of selenium (VI) reduction processes in sulfuric acid solutions when titanium electrodes are polarized by alternating current of industrial frequency (50 Hz). It was found that selenate ion reduction occurs on the surface of titanium electrodes in the cathode half-cycle of alternating current (practically at the cathode) by reaction: SeO_2^{-4}+ 6e + $8H^+ \rightarrow$ Se + $4H_2O$. In addition, the recovery is carried out by titanium (III) ions: $6Ti^{3+}$ SeO_2^{-4}+ $8H^+ \rightarrow$ Se + $6Ti^{4+}$ + $4H_2O$. It has been established that titanium (III) ions are products of dissolution of titanium during polarization by alternating current, so they can be formed by reaction: 2Ti + $6H^+ \rightarrow 2Ti^{3+} + 3H_2$. Reduction in selenate ions during polarization by alternating current can also occur due to the cementation reaction with titanium: 3Ti + $2SeO_2^{-4}$ + $16H^+ \rightarrow$ 2Se + $8H_2O$ + $3Ti^{4+}$. It was shown for the first time that the selenate ion is reduced to form a dispersed selenium powder with a high current efficiency. Depending on the conditions, both amorphous and crystalline selenium modifications are produced.	Abduali Bayeshov, Azhar Bayeshova, Khairulla Zhanbekov, Madina Zhubanys and Pakhchan Naguman Inorganics 2022, 10(6), 72 https://doi.org/10.3390/inorganics10060072

52.	Production of Copper Powders by Alternating Current Polarization of a Copper–Titanium Electrode Pair	10.1134/S1070427222050081	The possibility of obtaining copper powders using alternating current of industrial frequency is shown. The electrochemical circuit consisted of two cells connected in parallel. A copper–titanium electrode pair was installed in each cell. The electrolyte was an aqueous solution containing copper(II) sulfate. In cell 1, during electrolysis, the copper electrode dissolves in the positive half-cycle with the formation of Cu2+, which are reduced on the titanium electrode to Cu0 in the form of a dispersed powder. In cell 2 in this half-cycle, the electrolysis does not occur. When the direction of the current is changed, electrolysis occurs only in cell 2. It was found that when the current density changes in the range of 10–75 kA m–2, the current efficiency of Cu0 in each cell increases from 31 to 85.2%. When the concentration of Cu2+ varies within 5–10 g L–1, the current efficiency of Cu0 in each cell increases to 84.2%. As a result of the process, ultrafine copper powders are formed. Scanning electron microscopy has shown that the average particle size of copper powders does not exceed 1 μm.	Bayeshova A. A. K. Bayeshova, A. N. Zhylysbayeva, A. S. Kadirbayeva, R. N. Nurdillayeva. Russian Journal of Applied Chemistry. – 2022. - Vol. 95. - No.5. – P.685–688/ 10.1134/S1070427222050081
53.	Synthesis and Growth of Rare Earth Borates $NaSrR(BO_3)_2$ (R = Ho–Lu, Y, Sc)	10.1021/acs.inorgchem.2c00596	$NaSrR(BO_3)_2$ (R = Ho-Lu, Y, Sc) compounds were obtained for the first time. Their structures exhibit disordered positions of Sr^{2+} and Na^{+} atoms while RO6 polyhedra are connected through the BO3 groups. Large distances between R atoms and high transparency in the range of 250-900 nm make them promising for phosphor applications. A pathway to obtain single crystals was shown by growing $NaSrY(BO_3)_2$ and $NaSrYb(BO_3)_2$ by the top seeded solution growth method with Na_2O-B_2O_3-NaF flux.	Kuznetsov A.B., Kokh K.A., Sagatov N., Gavryushkin P.N., Molokeev M.S., Svetlichnyi V.A., Lapin I.N., Kononova N.G., Shevchenko V.S., Bolatov A., Uralbekov B., Goreiavcheva A.A., Kokh A.E. Synthesis and Growth of Rare Earth Borates $NaSrR(BO_3)_2$ (R = Ho–Lu, Y, Sc). Inorganic Chemistry, V.61, Is.19, p.7497-7505, 2022. 10.1021/acs.inorgchem.2c00596
54.	Single-phase CZTSe via isothermal recrystallization in a KI-KCl flux	(2022) CrystEngComm, 24 (12), pp. 2291 - 2296.	A facile, two-step procedure was developed to prepare a pure CZTSe (Cu2ZnSnSe4) phase from elemental Cu, Zn, Sn, and Se with the addition of a KI-KCl mixture. During the first step, the mixture charge was reacted at 1000 °C to convert all the metals to selenides. Next, the extracted charge was	Bakhadur A.M., Uralbekov B.M., Atuchin V.V., Mukherjee S., Kokh K.A. Single-phase CZTSe via isothermal recrystallization in a KI-KCl flux

		DOI: 10.1039/d1ce01653a	powdered and again heated to 750 °C to obtain homogeneous grains of CZTSe with a size of 30-100 microns. The main intermediate phase during the synthesis of Cu2SnSe3 was found to dissolve Zn up to 11.5 at% and, without Raman spectroscopy data, this phase could be easily confused with CZTSe because they are not optically distinguishable. On the other hand, the deviation of the Zn content in CZTSe does not exceed ±0.5 at%	(2022) CrystEngComm, 24 (12), pp. 2291 - 2296. DOI: 10.1039/d1ce01653a
55.	Effect of mineral fertilisers application on the transfer of natural radionuclides from soil to radish (Raphanus sativus L.)	DOI: 10.1016/j.jenvrad.2022.106863	Non-controlled usage of mineral fertilisers in agriculture land of Kazakhstan is a concerning issue, due to possible contamination of the soil by radionuclides. Pot experiment of growing of R. sativus with application of mineral fertilisers was carried out under natural conditions. Two commonly used mineral fertilisers, mono-potassium phosphate and ammonium nitrate, were chosen in the frame of current research to determine the impact of mineral 33haracteri on transfer of natural radionuclides from soil to R. sativus edible part. For this goal, the activity concentrations of natural radionuclides U-234, U-238, Th-230, Th-232 and Ra-226, were determined in both R. sativus edible part and the investigated soil by using alpha-particle spectrometry. The highest activity concentrations were found for R. sativus edible part growing on soil that was 33haracteri by mono-potassium phosphate and were equal to 174 ± 17, 134 ± 15, 62 ± 4, 15 ± 2 and 2.8 ± 0.6 Bq/kg for U-234, U-238, Th-230, Th-232 and Ra-226, respectively. The results of soil-to- R. sativus edible part transfer factor for different radionuclides varied depending on the mineral 33haracteri used. For evaluation of impact during consumption of R. sativus edible part by a population of Kazakhstan, annual effective ingestion dose and excess lifetime cancer risk were determined. The highest annual effective ingestion dose was found for R. sativus edible part cultivated in mono-potassium phosphate-fertilised soil and was equal to 4.4 μSv $year^{-1}$.	Nursapina NA, Shynybek BA, Matveyeva IV, Nazarkulova SN, Štrok M, Benedik L, Ponomarenko OI. Effect of mineral fertilisers application on the transfer of natural radionuclides from soil to radish (Raphanus sativus L.). J Environ Radioact. 2022 Jun;247:106863. Doi: 10.1016/j.jenvrad.2022.106863 .
56.	Uranium isotopes in food and effect on health of Southern Kazakhstan citizens	DOI: 10.1016/j.jenvrad.2022.106863	Natural uranium isotopes were determined in food products of the Kyzylorda region in Kazakhstan. This region is 33haracterized by the influence of the uranium industry, as up to 15% of the world uranium reserves are concentrated in this	Nursapina, N., Diyarov, A., Matveyeva, I., Nazarkulova, S., Ponomarenko, O. (2022) Uranium isotopes in food and

			part of Kazakhstan and the adjacent territory of Kyrgyzstan. The food products most consumed by locals were selected for this survey. Special attention was paid to the analysis of edible and non-edible parts of food products and the assessment of a possible increase in risk due to consumption of non-edible parts. The highest content of uranium, of 80.2 mu g/kg, was found in the edible part of the carrot. The highest activity concentrations of uranium isotopes are found in carrot, potato and onion, as edible parts of these vegetables are grown in the soil. All estimated cancer risks for uranium isotopes range from 10(-14) to 10(-12), which are insignificant values.	effect on health of Southern Kazakhstan citizens. Food Additives and Contaminants: Part B Surveillance, V.15, Is1., P.56-61, 2022. https://doi.org/10.1080/19393210.2021.2010810
57.	DMSO- mediated solvothermal synthesis of S/AgX (X = Cl, Br) microstructures and study of their photocatalytic and biological activity	DOI10.1016/j.apsusc.2022.154122	Microstructures with different content of sulfur (S) and silver halides (AgX, X = Cl, Br) were obtained by DMSO-mediated solvothermal synthesis with using of two methods: 1) precipitation of S at room temperature and 2) precipitation of S with water. The XRD and Raman analysis has shown the presence of S and AgX phases. The SEM analysis have displayed that S/AgX microstructures are represented by agglomerates of S with irregular form with 25-50 mu m in size, which are mostly covered by spherical particles of AgX with size range from 0.7 to 2 mu m. These results were proved by TEM elemental mapping. TEM analysis also showed the presence of the dense micron-sized aggregates of particles from 5 to 100 nm with highly developed system of dense intergrain boundaries for S/AgCl sample, while S/AgBr sample was represented by large aggregates of crystalline particles and an amorphous matrix. Obtained microstructures exhibited low specific surface area. XPS revealed the presence of metallic silver on the surface of all samples due to partial photoreduction. Its content was much higher when sulfur was precipitated at laboratory temperature. According to TGA-DSC analysis the actual composition of the microstructures corresponds to the desired content. The samples with the highest content of AgX were able to degrade from 70 to 90 % of molecules of Orange II, after 180 min of visible light irradiation. Up to 5 cycles, almost similar photocatalytic activity could be retained for all the samples. The majority of the samples exhibited antimicrobial activity,	Khan, N., Balaz, M., Burkitbayev, M., Tatykayev, B., Shalabayev, Z., Nemkayeva, R., Jumagaziyeva, A., Niyazbayeva, A., Rakhimbek, I., Beldeubayev, A., Urakaev, F. DMSO- mediated solvothermal synthesis of S/AgX (X = Cl, Br) microstructures and study of their photocatalytic and biological activity. Applied surface science, V.601., 2022. DOI10.1016/j.apsusc.2022.154122

			namely they were active in suppression of the S. aureus ATCC 6538-P, E. coli ATCC 8739, C.albicans ATCC 10231, P.aeruginosa ATCC 9027, Erwinia amylovora, S. aureus ATCC BAA-39 and E. coli ATCC BAA-196 strains.	
58.	Sustainable Synthesis of Cadmium Sulfide, with Applicability in Photocatalysis, Hydrogen Production, and as an Antibacterial Agent, Using Two Mechanochemical Protocols	https://doi.org/10.3390/nano12081250	CdS nanoparticles were successfully synthesized using cadmium acetate and sodium sulfide as Cd and S precursors, respectively. The effect of using sodium thiosulfate as an additional sulfur precursor was also investigated (combined milling). The samples were characterized by XRD, Raman spectroscopy, XPS, UV-Vis spectroscopy, PL spectroscopy, DLS, and TEM. Photocatalytic activities of both CdS samples were compared. The photocatalytic activity of CdS, which is produced by combined milling, was superior to that of CdS, and was obtained by an acetate route in the degradation of Orange II under visible light irradiation. Better results for CdS prepared using a combined approach were also evidenced in photocatalytic experiments on hydrogen generation. The antibacterial potential of mechanochemically prepared CdS nanocrystals was also tested on reference strains of E. coli and S. aureus. Susceptibility tests included a 24-h toxicity test, a disk diffusion assay, and respiration monitoring. Bacterial growth was not completely inhibited by the presence of neither nanomaterial in the growth environment. However, the experiments have confirmed that the nanoparticles have some capability to inhibit bacterial growth during the logarithmic growth phase, with a more substantial effect coming from CdS nanoparticles prepared in the absence of sodium thiosulfate. The present research demonstrated the solvent-free, facile, and sustainable character of mechanochemical synthesis to produce semiconductor nanocrystals with multidisciplinary application.	Shalabayev, Z.; Baláž, M.; Khan, N.; Nurlan, Y.; Augustyniak, A.; Daneu, N.; Tatykayev, B.; Dutková, E.; Burashev, G.; Casas-Luna, M.; Džunda, R.; Bureš, R.; Čelko, L.; Ilin, A.; Burkitbayev, M. Sustainable Synthesis of Cadmium Sulfide, with Applicability in Photocatalysis, Hydrogen Production, and as an Antibacterial Agent, Using Two Mechanochemical Protocols. Nanomaterials 2022, 12, 1250. https://doi.org/10.3390/nano12081250

59.	Mechanochemical synthesis of non-stoichiometric copper sulfide Cu1.8S applicable as a photocatalyst and antibacterial agent and synthesis scalability verification	DOI 10.1039/d2fd00082b	An effort to prepare different non-stoichiometric CuxSy compounds starting from elemental precursors using mechanochemistry was made in this study. However, out of the 7 stoichiometries tested, it was only possible to obtain three phases: covellite CuS, chalcocite Cu2S and digenite Cu1.8S and their mixtures. To obtain the digenite phase with the highest purity, the Cu : S stoichiometric ratio needed to be fixed at 1.6 : 1. The reaction between copper and sulfur was completed within a second range, however, milling was performed for up to 15 minutes until the equilibrium in phase composition between digenite and covellite was reached. The possibility of preparing the product in a 300 g batch by eccentric vibratory milling in 30 minutes was successfully verified at the end. The estimated crystallite sizes for the digenite Cu1.8S obtained via lab-scale and scalable experiments were around 12 and 17 nm, respectively. The obtained products were found to be efficient photocatalysts under visible light irradiation in the presence of hydrogen peroxide, being capable of the complete degradation of the Methyl Orange dye in a concentration of 10 mg L−1 in 2 hours. Finally, the antibacterial potential of both lab-scale and large-scale industrial products was proven and, regardless of the manufacturing scale, the nanoparticles retained their properties against bacterial cells	Baláž M., Augustyniak A., Tatykayev B., Shalabayev Z., Burashev G., Dutková E., Daneu N., Briančin J., Balážová Ľ., Tkáčiková Ľ., Stahorský M., Achimovičová M., Baláž P. Mechanochemical synthesis of non-stoichiometric copper sulfide Cu1.8S applicable as a photocatalyst and antibacterial agent and synthesis scalability verification (2022) Faraday Discussions, 241, pp. 367 – 386. DOI: 10.1039/d2fd00082b
60.	Photoluminescence Quenching Concentration and Quantum Yield in $(Y_{1-x}Pr_x)_2O_2Se$ Solid Solutions	10.1134/S0020168521080 15X	Abstract—$(Y_{1-x}Pr_x)_2O_2Se$ solid solutions with x = 0.004, 0.008, 0.010, 0.012, and 0.020 have been prepared from oxides by ampule synthesis. We have measured their excitation spectra at λ_{em} = 514 nm and their photoluminescence and quantum yield spectra at λ_{ex} = 463 nm (T = 300 K). Comparing their emission intensities at wavelengths of 514 ($^3P_0 \rightarrow {}^3H_4$ transition) and 670 nm ($^3P_0 \rightarrow {}^3F_2$ transition), we have determined the optimal dopant concentration (x = 0.01), at which the quantum yield has a maximum, reaching 3%	Tarasenko, M.S., Ryadun, A.A., Orazov, Z.K. *et al.* The Concentration Quenching of Photoluminescence and the Quantum Yield in $(Y_{1-x}Pr_x)_2O_2Se$ Solid Solutions. *Inorg Mater* 57, 830–834 (2021). https://doi.org/10.1134/S0020168521080 15X
61.	Transformation of teacher training in a rapidly evolving digital environment	DOI: 10.1007/s10639-021-10749-z	The purpose of the study is to consider the problem of digital competence of rising teachers and provide recommendations for its improvement. The study generally describes the widespread use of digital tools in the classroom, namely the	V. Shurygin, R Ryskaliyeva, E. Dolzhich, S. Dmitrichenkova, A.Ilyin

			current situation, barriers and prospects associated with it. The research was conducted using a digital questionnaire that was sent to respondents by e-mail.	Transformation of teacher training in a rapidly evolving digital environment Education and Information Technologies 2022 | Journal article DOI: 10.1007/s10639-021-10749-z
62.	Properties of $CuFeS_2/TiO_2$ Nanocomposite Prepared by Mechanochemical Synthesis	DOI: 10.3390/ma15196913	Abstract: CuFeS2/TiO2 nanocomposite has been prepared by a simple, low-cost mechanochemical route to assess its visible-light-driven photocatalytic efficiency in Methyl Orange azo dye decolorization. The structural and microstructural characterization was studied using X-ray diffraction and high-resolution transmission electron microscopy. The presence of both components in the composite and a partial anatase-to-rutile phase transformation was proven by X-ray diffraction. Both components exhibit crystallite size below 10 nm. The crystallite size of both phases in the range of 10– 20 nm was found and confirmed by TEM. Surface and morphological properties were characterized by scanning electron microscopy and nitrogen adsorption measurement. Scanning electron microscopy has shown that the nanoparticles are agglomerated into larger grains. The specific surface area of the nanocomposite was determined to be 21.2 m2· g−1. Optical properties using UVVis and photoluminescence spectroscopy were also investigated. CuFeS2/TiO2 nanocomposite exhibits strong absorption with the determined optical band gap 2.75 eV. Electron paramagnetic resonance analysis has found two types of paramagnetic ions in the nanocomposite. Mössbauer spectra showed the existence of antiferromagnetic and paramagnetic spin structure in the nanocomposite. The CuFeS2/TiO2 nanocomposite showed the highest discoloration activity with a MO conversion of ~ 74% after 120 min irradiation. This study has shown the possibility to prepare nanocomposite material with enhanced photocatalytic activity of decoloration of MO in the visible range by an environmentally friendly manner	Erika Dutkova, Matej Baláž, Nina Daneu, Batukhan Tatykayev, et al. «Properties of CuFeS2/TiO2 Nanocomposite Prepared by Mechanochemical Synthesis." *Materials* 15, no. 19 (2022): 6913. DOI: 10.3390/ma15196913

63.	Peroxide Oxidative Desulfurization of the Gas Condensate from Karachaganak Field	(2022) Petroleum Chemistry, 62 (9), pp. 1081 – 1086. DOI: 10.1134/S0965544122090080	Oxidative desulfurization of the gas condensate from Karachaganak field (Kazakhstan) was carried out. The influence of the oxidation conditions on the residual sulfur content in the gas condensate was examined. It was found that oxidation at a temperature of 60°C in the presence of hydrogen peroxide, as well as of sodium molybdate as a catalyst, affords a 91% decrease in the total sulfur content in the gas condensate. The oxidative desulfurization process was shown to have no significant effect on the physicochemical characteristics of the gas condensate	Muktaly D., Myltykbaeva Z.K., Akopyan A.V., Smaiyl M.B. Peroxide Oxidative Desulfurization of the Gas Condensate from Karachaganak Field (2022) Petroleum Chemistry, 62 (9), pp. 1081 – 1086. DOI: 10.1134/S0965544122090080
64.	Thermal methods of solid fuel processing: review	(2022) Oil Shale, 39 (3), pp. 217 - 240. DOI: 10.3176/oil.2022.3.04	A review of literature data on the processing of solid types of combustible fossils into liquid fuels and chemical products has been carried out. The reserves of solid fossil fuels far exceed the natural resources of oil and gas, so the development of methods for processing solid fossil fuels into chemical products and liquid fuels is an urgent task. The main methods of processing coal and oil shale (OS) are reduced to pyrolysis and supercritical gasification. Pyrolysis is preferred for processing oil shale into shale oil, and currently a promising method for processing coal is extraction with supercritical solvents such as water and CO2 at temperatures up to 900 °C and in some cases with the addition of a catalyst. For oil shale, the gasification process, like pyrolysis, is carried out under milder conditions, since the mineral part of oil shale contains trace elements that act as catalysts, and the structure of the organic part of oil shale is more similar in composition to oil.	Myltykbayeva Z.K., Yeshova Z.T., Smaiyl M.B. Thermal methods of solid fuel processing: review (2022) Oil Shale, 39 (3), pp. 217 - 240. DOI: 10.3176/oil.2022.3.04
65.	Synthesis of polymer protected Pd–Ag/ZnO catalysts for phenylacetylene hydrogenation	(2022) Journal of Nanoparticle Research, 24 (12), art. no. 236. DOI: 10.1007/s11051-022-05621-1	A simple and environmentally friendly method, based on sequential adsorption of polyacrylamide (PAM) and transition metal ions (Pd2+, Ag+) on zinc oxide precipitated from water solution, was used to synthesize supported mono- and bimetallic catalysts with various Pd:Ag ratios. The catalyst characterization results indicated that PAM and metal ions are completely adsorbed by zinc oxide, forming polymer-stabilized Pd and Ag nanoparticles of 1–3 nm in size, evenly distributed on the support surface. The catalysts were studied in the hydrogenation of phenylacetylene under mild conditions (0.1 MPa, 40 °C). Although Ag-free 1%Pd-	Zharmagambetova A., Auyezkhanova A., Talgatov E., Jumekeyeva A., Buharbayeva F., Akhmetova S., Myltykbayeva Z., Nieto J.M.L. Synthesis of polymer protected Pd–Ag/ZnO catalysts for phenylacetylene hydrogenation (2022) Journal of Nanoparticle Research, 24 (12), art. no. 236.

			PAM/ZnO catalyst presents an interesting catalytic performance (in terms of activity, selectivity, and stability), among PAM-modified catalysts the optimal was 1%Pd–Ag(3:1)-PAM/ZnO, presenting a selectivity to styrene of 88% at 91% conversion of phenylacetylene. For comparison, similar Pd–Ag (3:1) bimetallic catalysts modified with polysaccharides, such as pectin (Pec), chitosan (Chit), and 2-hydroxyethylcellulose (HEC), were studied in the hydrogenation process. The catalysts demonstrated nearly the same selectivity to styrene. The activity of the catalysts decreases in the following order: 1%Pd–Ag(3:1)-HEC/ZnO > 1%Pd–Ag(3:1)-PAM/ZnO > 1%Pd–Ag(3:1)-Pec/ZnO > 1%Pd–Ag(3:1)-Chit/ZnO.	DOI: 10.1007/s11051-022-05621-1
66.	V-Porphyrins Encapsulated or Supported on Siliceous Materials: Synthesis, Characterization, and Photoelectrochemical Properties	(2022) Materials, 15 (21), art. no. 7473. DOI: 10.3390/ma15217473	Metalloporphyrin-containing mesoporous materials, named VTPP@SBA, were prepared via a simple anchoring of vanadyl porphyrin (5,10,15,20-Tetraphenyl-21H,23H-porphine vanadium(IV) oxide) through a SBA-15-type mesoporous material. For comparison, vanadyl porphyrin was also impregnated on SiO2 (VTPP/SiO2). The characterization results of catalysts by XRD, FTIR, DR-UV-vis, and EPR confirm the incorporation of vanadyl porphyrin within the mesoporous SBA-15. These catalysts have also been studied using electrochemical and photoelectrochemical methods. Impedance measurements confirmed that supporting the porphyrin in silica improved the electrical conductivity of samples. In fact, when using mesoporous silica, current densities associated with oxidation/reduction processes appreciably increased, implying an enhancement in charge transfer processes and, therefore, in electrochemical performance. All samples presented n-type semiconductivity and provided an interesting photoelectrocatalytic response upon illumination, especially silica-supported porphyrins. This is the first time that V-porphyrin-derived materials have been tested for photoelectrochemical applications, showing good potential for this use.	Myltykbayeva Z.K., Seysembekova A., Moreno B.M., Sánchez-Tovar R., Fernández-Domene R.M., Vidal-Moya A., Solsona B., López Nieto J.M. V-Porphyrins Encapsulated or Supported on Siliceous Materials: Synthesis, Characterization, and Photoelectrochemical Properties (2022) Materials, 15 (21), art. no. 7473. DOI: 10.3390/ma15217473
67.	COMPARATIVE CHARACTERISTICS OF	(2022) Chemistry and Chemical	Phenomena of remote interaction in intergel systems polymethacrylic acid hydrogel – poly-4-vinyl-pyridine hydrogel (hPMAA-hP4VP) and polymethacrylic acid hydrogel – poly-2-	Jumadilov T., Malimbayeva Z., Yskak L., Suberlyak O., Kondaurov R., Imangazy A.,

	POLYMETHACRYLIC ACID HYDROGEL SORPTION ACTIVITY IN RELATION TO LANTHANUM IONS IN DIFFERENT INTERGEL SYSTEMS	Technology, 16 (3), pp. 418 – 431 DOI: 10.23939/chcht16.03.418 (Q3 in Chemical Engineering (miscellaneous))	methyl-5-vinylpyridine hydrogel (hPMAA-hP2M5VP) have been studied. It was found that there is a decrease of specific electric conductivity, pH and swelling degree of PMAA, P4VP, P2M5VP hydrogels during lanthanum ions sorption by the intergel systems. Significant increase of sorption properties (up to 30 %) in intergel systems comparatively with individual hydrogels of PMAA, P4VP, P2M5VP points to the fact of high ionization during mutual activation of the polymers. Maximum sorption of lanthanum ions occurs at the ratios of 17%hPMAA:83%hP4VP and 50%hPMAA: 50%hP2M5VP. Data on obtained IR spectra evidence to the sorption of the rare-earth metal by these intergel systems. The obtained results show a significant importance of possible application of intregel systems based on rare-crosslinked polymer hydrogels of acid and basic nature for creation of new innovative sorption technologies in hydrometallurgy.	Agibayeva L., Akimov A., Khimersen K., Zhuzbayeva A. COMPARATIVE CHARACTERISTICS OF POLYMETHACRYLIC ACID HYDROGEL SORPTION ACTIVITY IN RELATION TO LANTHANUM IONS IN DIFFERENT INTERGEL SYSTEMS (2022) Chemistry and Chemical Technology, 16 (3), pp. 418 - 431 DOI: 10.23939/chcht16.03.418
68.	The design of viscometer with smartphone controlling	(2022) Indonesian Journal of Electrical Engineering and Computer Science, 27 (1), pp. 366 - 374 DOI: 10.11591/ijeecs.v27.i1.pp366-374 (Q3 in Computer Networks and Communications)	New design of a viscometer based on the stokes viscosity measurement method is proposed. The principle of operation of this viscosimetr is based on the use of ball periodic alternated movement in a horizontally positioned cuvette that filled with the test liquid. The movement appears under the influence of a magnetic field that created by two electromagnets. Registration of the ball movement inside the cuvette is carried out using an optoelectronic pair. A distinctive feature of the proposed design is control by using a program that installed on the user's smartphone, which also carries out the primary data processing. Data transmission is carried out over the radio channel using a Bluetooth module. Disposable cuvettes are used for measurements. This approach makes it possible to significantly reduce both the device production costs and operating costs by eliminating most of the operations for the device preparing for working (the vast majority of existing types of viscometers require thorough flushing of all units in contact with the test medium). In addition, the proposed approach excludes the occurrence of measurement errors associated with insufficiently thorough preparation of the device for operation.	Suleimenov I.E., Mun G.A., Kabdushev S.B., Alikulov A., Shaltykova D.B., Moldakhan I. The design of viscometer with smartphone controlling DOI: 10.11591/ijeecs.v27.i1.pp366-374

69.	Study on vacuum drying kinetics and processing of the Lonicera japonica Thunb. aqueous extracts	(2022) LWT, 167, art. no. 113868 DOI: 10.1016/j.lwt.2022.113868 (Q1 in Food Science)	To reveal the vacuum drying mechanism of aqueous extracts and develop vacuum drying processing to provide theoretical guidance for Lonicera japonica Thunb. aqueous extracts, the effects of vacuum pressure (10, 15, 20, 25, 30 kPa), drying temperature (80, 90, 100, 110, 120 °C), and material thickness (2, 4 mm) of vacuum drying on the moisture ratio, drying rate, material temperature, moisture effective diffusivity, activation energy, content and distribution of moisture, water-solubility, flowability, antioxidant capacity, and the contents of chlorogenic acid and galuteolin contents were investigated. Results showed that the drying mechanism of the aqueous extracts was different from that of conventional porous media, which contains drying stagnation and boiling phenomenon. The initial bound water content of the aqueous extracts was 100%, and the bound water will not convert to free water during vacuum drying. The best vacuum drying process for the L. japonica Thunb. aqueous extracts was 30 min, 4 mm, 120 °C and 10 kPa.	Xu P., Zhang Z., Peng X., Yang J., Li X., Yuan T., Jia X., Liu Y., Abdullaev O., Jenis J. Study on vacuum drying kinetics and processing of the Lonicera japonica Thunb. aqueous extracts (2022) LWT, 167, art. no. 113868 DOI: 10.1016/j.lwt.2022.113868
70.	Traditional Use, Phytochemical Profiles and Pharmacological Properties of Artemisia Genus from Central Asia	(2022) Molecules, 27 (16), art. no. 5128 DOI: 10.3390/molecules27165128 (Q1 in Chemistry (miscellaneous))	The flora of Kazakhstan is characterized by its wide variety of different types of medicinal plants, many of which can be used on an industrial scale. The Traditional Kazakh Medicine (TKM) was developed during centuries based on the six elements of ancient Kazakh theory, associating different fields such as pharmacology, anatomy, pathology, immunology and food nursing as well as disease prevention. The endemic Artemisia L. species are potential sources of unique and new natural products and new chemical structures, displaying diverse bioactivities and leading to the development of safe and effective phytomedicines against prevailing diseases in Kazakhstan and the Central Asia region. This review provides an overview of Artemisia species from Central Asia, particularly traditional uses in folk medicine and the recent numerous phytochemical and pharmacological studies. The review is done by the methods of literature searches in well-known scientific websites (Scifinder and Pubmed) and data collection in university libraries. Furthermore, our aim is to search for promising and potentially active Artemisia species candidates, encouraging us to analyze Protein Tyrosine Phosphatase 1B (PTP1B), α-	Nurlybekova A., Kudaibergen A., Kazymbetova A., Amangeldi M., Baiseitova A., Ospanov M., Aisa H.A., Ye Y., Ibrahim M.A., Jenis J. Traditional Use, Phytochemical Profiles and Pharmacological Properties of Artemisia Genus from Central Asia (2022) Molecules, 27 (16), art. no. 5128 DOI: 10.3390/molecules27165128

			glucosidase and bacterial neuraminidase (BNA) inhibition as well as the antioxidant potentials of Artemisia plant extracts, in which endemic species have not been explored for their secondary metabolites and biological activities so far. The main result of the study was that, for the first time, the species Artemisia scopiformis Ledeb. Artemisia albicerata Krasch., Artemisia transiliensis Poljakov, Artemisia schrenkiana Ledeb., Artemisia nitrosa Weber and Artemisia albida Willd. ex Ledeb. due to their special metabolites, showed a high potential for α-glucosidase, PTP1B and BNA inhibition, which is associated with diabetes, obesity and bacterial infections. In addition, we revealed that the methanol extracts of Artemisia were a potent source of polyphenolic compounds. The total polyphenolic contents of Artemisia extracts were correlated with antioxidant potential and varied according to plant origin, the solvent of extraction and the analytical method used. Consequently, oxidative stress caused by reactive oxygen species (ROS) may be managed by the dietary intake of current Artemisia species. The antioxidant potentials of the species A. schrenkiana, A. scopaeformis, A. transiliensis and Artemisia scoparia Waldst. & Kitam. were also promising. In conclusion, the examination of details between different Artemisia species in our research has shown that plant materials are good as an antioxidant and eznyme inhibitory functional natural source.	
71.	The Effect of Poly (Propylene Glycol - g - Styrene) on the Physicomechanical Properties of Unsaturated Polyester Resin	(2022) Egyptian Journal of Chemistry, 65 (4), pp. 715 - 722 DOI: 10.21608/EJCHEM.2021.93860.4419 (Q3 in Chemistry (miscellaneous))	Unsaturated polyester resin (UPR) is a thermoset-type polymer, and it is widely used in the fiber-reinforced plastic industry. This can be attributed to its low cost, ease of processing and combination with reinforcements, rapid cure, excellent dimensional stability, and a wide variety of grades available. This study was conducted to investigate the effect of grafted copolymers on the properties of UPR. Testing included viscosity, gel time, curing temperature, hardness, tensile strength, and compressive strength. The grafted copolymers were based on polypropylene glycol (PPG) grafted with styrene (St) at different St ratios (65/15, 65/25, 65/35). The grafted copolymers were prepared by free-radical polymerization in the presence of potassium persulphate as an initiator. The results showed that significant improvement	Negim E.-S., Bekbayeva L., Irmukhametova G.S., Alfergani A.A., Kalugin S.N. The Effect of Poly (Propylene Glycol - g - Styrene) on the Physicomechanical Properties of Unsaturated Polyester Resin (2022) Egyptian Journal of Chemistry, 65 (4), pp. 715 - 722 DOI: 10.21608/EJCHEM.2021.93860.4419

			in the physical and mechanical properties of UPR due to the modification of UPR by the prepared grafted copolymer. It was found that the physical and mechanical properties of UPR enhanced with increasing the ratio of St in the grafted copolymer and the concentration of grafted copolymers. This is attributed to the high rigidity of the grafted copolymer containing the highest styrene content.	
72.	Polymeric iodophors with poly(2-ethyl-2-oxazoline) and poly(N-vinylpyrrolidone): optical, hydrodynamic, thermodynamic, and antimicrobial properties	(2022) European Polymer Journal, 165, art. no. 111005 DOI: 10.1016/j.eurpolymj.2022.111005 (Q1 in Polymers and Plastics)	Formation of iodophors by interactions of poly(2-ethyl-2-oxazoline) and poly(N-vinylpyrrolidone) with molecular iodine dissolved in aqueous solutions with addition of potassium iodide and ethanol has been studied using a range of physicochemical techniques including UV–Vis spectroscopy, viscometry, dynamic light scattering, isothermal titration calorimetry and partitioning through semi-permeable membrane. It was established that poly(2-ethyl-2-oxazoline) exhibits greater ability to bind iodine compared to poly(N-vinylpyrrolidone). Despite the difference in the binding ability of these two polymers, their iodophors exhibited similar antimicrobial properties.	Makhayeva D.N., Filippov S.K., Yestemes S.S., Irmukhametova G.S., Khutoryanskiy V.V. Polymeric iodophors with poly(2-ethyl-2-oxazoline) and poly(N-vinylpyrrolidone): optical, hydrodynamic, thermodynamic, and antimicrobial properties (2022) European Polymer Journal, 165, art. no. 111005 DOI: 10.1016/j.eurpolymj.2022.111005
73.	Thiol-Ene “Click Reactions” as a Promising Approach to Polymer Materials	(2022) Polymer Science - Series B, 64 (1) DOI: 10.1134/S1560090422010055 (Q3 in Polymers and Plastics)	This review is devoted to relatively new and promising approach to the synthesis of novel organic compounds and polymer materials, based on the “click chemistry” concept. Several types of the “click reactions” (cycloaddition, nucleophilic ring opening, non-aldol carbonyl chemistry, and addition to multiple carbon-carbon bonds) have been described, and the relevant examples have been provided. The “thiol-ene” reactions based on the addition of thiol to unsaturated functional groups of organic molecules have been mostly considered in this review, including their conditions and mechanisms. Diverse and wide range of applications of the thiol-ene “click chemistry” has been demonstrated, including the preparation of biocompatible materials and materials for culture and encapsulation of cells; the synthesis of block copolymers; the development of degradable materials as well as novel homogeneous and	Kazybayeva D.S., Irmukhametova G.S., Khutoryanskiy V.V. Thiol-Ene “Click Reactions” as a Promising Approach to Polymer Materials (2022) Polymer Science - Series B, 64 (1) DOI: 10.1134/S1560090422010055

			hybrid network structures; chromatography, glycopolymer synthesis, immobilization of proteins, stabilization/functionalization of capsules and multilayer systems, functionalized micro- and nanogels, nanomedicine, and development of antitumor drugs.	
74.	Aldehyde-functional thermoresponsive diblock copolymer worm gels exhibit strong mucoadhesion	(2022) Chemical Science, 13 (23), pp. 6888 - 6898 DOI: 10.1039/d2sc02074b (Q1 in Chemistry (miscellaneous))	A series of thermoresponsive diblock copolymer worm gels is prepared via reversible addition-fragmentation chain transfer (RAFT) aqueous dispersion polymerization of 2-hydroxypropyl methacrylate using a water-soluble methacrylic precursor bearing pendent cis-diol groups. Selective oxidation using an aqueous solution of sodium periodate affords the corresponding aldehyde-functional worm gels. The aldehyde groups are located within the steric stabilizer chains and the aldehyde content can be adjusted by varying the periodate/cis-diol molar ratio. These aldehyde-functional worm gels are evaluated in terms of their mucoadhesion performance with the aid of a fluorescence microscopy-based assay. Using porcine urinary bladder mucosa as a model substrate, we demonstrate that these worm gels offer a comparable degree of mucoadhesion to that afforded by chitosan, which is widely regarded to be a 'gold standard' positive control in this context. The optimum degree of aldehyde functionality is approximately 30%: lower degrees of functionalization lead to weaker mucoadhesion, whereas higher values compromise the desirable thermoresponsive behavior of these worm gels.	Brotherton E.E., Neal T.J., Kaldybekov D.B., Smallridge M.J., Khutoryanskiy V., Armes S.P. Aldehyde-functional thermoresponsive diblock copolymer worm gels exhibit strong mucoadhesion (2022) Chemical Science, 13 (23), pp. 6888 - 6898 DOI: 10.1039/d2sc02074b
75.	Polymer Architecture Effects on Poly(N,N-Diethyl Acrylamide)-b-Poly(Ethylene Glycol)-b-Poly(N,N-Diethyl Acrylamide) Thermoreversible Gels and Their Evaluation as a Healthcare Material	(2022) Macromolecular Bioscience, 22 (3), art. no. 2100432 DOI: 10.1002/mabi.202100432 (Q1 in Polymers and Plastics)	Thermoreversible gels which transition between liquid-like and solid-like states when warmed have enabled significant novel healthcare technologies. Poly(N,N-diethyl acrylamide) (PDEA) is a thermoresponsive polymer which can be used as a trigger to form thermoreversible gels, however its use in these materials is limited and crucial design principles are unknown. Herein ABA copolymers with the structure PDEA-b-poly(ethylene glycol) (PEG)-b-PDEA are synthesized to give four block copolymers with varied molecular weight of PDEA and PEG blocks. Rheometry on solutions of the block copolymers reveals that high molecular weight PEG blocks are required to form thermoreversible gels with predominantly	Haddow P.J., da Silva M.A., Kaldybekov D.B., Dreiss C.A., Hoffman E., Hutter V., Khutoryanskiy V.V., Kirton S.B., Mahmoudi N., McAuley W.J., Cook M.T. Polymer Architecture Effects on Poly(N,N-Diethyl Acrylamide)-b-Poly(Ethylene Glycol)-b-Poly(N,N-Diethyl Acrylamide) Thermoreversible

			solid-like behavior. Furthermore, small-angle X-ray scattering elucidates clear differences in the nanostructure of the copolymer library which can be linked to distinct rheological behaviors. A thermoreversible gel formulation based on PDEA (20 kDa)-b-PEG (10 kDa)-b-PDEA (20 kDa) is designed by optimizing the polymer concentration and ionic strength. It is found that the gel is mucoadhesive, stable, and non-toxic, as well as giving controlled release of a hydrophobic drug. Overall, this study provides insight into the effect of polymer architecture on the nanostructure and rheology of PDEA-b-PEG-b-PDEA and presents the development of a highly functional thermoreversible gel with high promise for healthcare applications.	Gels and Their Evaluation as a Healthcare Material (2022) Macromolecular Bioscience, 22 (3), art. no. 2100432 DOI: 10.1002/mabi.202100432
76.	The role of the alkaline promoter on the formation of strength and burning of coal briquettes	(2022) South African Journal of Chemical Engineering, 42, pp. 156 - 161 DOI: 10.1016/j.sajce.2022.08.009 (Q1 in Fluid Flow and Transfer Processes)	Coal fines formed in the process of coal mining are of no commercial value and accumulate in dumps, harming the environment. At the same time, they can be used as a source of low-smoke fuel used by the population for domestic needs. To create such a product, it is necessary to solve many technical problems related to selecting binders for coal, providing mechanical strength, and initiating the combustion process of coal briquettes. This study presents the results of obtaining briquette fuel from fine particles of brown coal. Low-temperature pyrolysis determined the qualitative and quantitative composition of volatile components and proposed a mechanism for forming a porous structure of coal after thermal exposure. A composition of a mixture of caustic soda and grain processing waste was used as a binder for the production of briquettes. The mechanism of the formation of adhesive properties of the binder material is explained, and the optimal concentration of sodium hydroxide in it is determined. The positive role of caustic soda as a catalyst for the burning of briquettes is shown, and the activation energy of the burning process is calculated.	Kamunur K., Ketegenov T., Kalugin S., Karagulanova A., Zhaksibaev M. The role of the alkaline promoter on the formation of strength and burning of coal briquettes (2022) South African Journal of Chemical Engineering, 42, pp. 156 - 161 DOI: 10.1016/j.sajce.2022.08.009
77.	Biosynthesis of Secondary Metabolites Based on the Regulation of MicroRNAs	(2022) BioMed Research International, 2022, art. no. 9349897	MicroRNA (miRNA), a noncoding ribonucleic acid, is considered to be important for the progression of gene expression in plants and animals by rupture or translational repression of targeted mRNAs. Many types of miRNA regulate plant metabolism, growth, and response to biotic and	Hossain R., Quispe C., Saikat A.S.M., Jain D., Habib A., Janmeda P., Islam M.T., Radha, Daştan S.D., Kumar M., Butnariu M., Cho W.C.,

		DOI: 10.1155/2022/9349897 (Q2 in Biochemistry, Genetics and Moleular Biology (miscellaneous))	abiotic factors. miRNA characterization helps to expose its function in regulating the process of post-transcriptional genetic regulation. There are a lot of factors associated with miRNA function, but the function of miRNA in the organic synthesis of by-products by natural products is not yet fully elucidated. The current review is aimed at observing and characterizing miRNAs and identifying those involved in the functioning of the biosynthesis of secondary metabolites in plants, with their use in controlled manipulation.	Sharifi-Rad J., Kipchakbayeva A., Calina D. Biosynthesis of Secondary Metabolites Based on the Regulation of MicroRNAs (2022) BioMed Research International, 2022, art. no. 9349897 DOI: 10.1155/2022/9349897
78.	Phytochemical Profile and Biological Activity of the Ethanolic Extract from the Aerial Part of Crocus alatavicus Regel & Semen Growing Wildly in Southern Kazakhstan	(2022) Molecules, 27 (11), art. no. 3468 DOI: 10.3390/molecules27113468 (Q1 in Chemistry (miscellaneous))	The composition of the ethanolic extract from the aerial parts of Crocus alatavicus Regel & Semen from southern Kazakhstan spontaneous flora was analyzed together with the determination of its antibacterial, antifungal, antiviral and anticancer activity. The phytochemical profile analysis by high-performance liquid chromatography-electrospray ionization-quadrupole-time of flight-mass spectrometry (HPLC/ESI-QTOF-MS) revealed the presence of multiple kaempferol derivatives. High-performance reverse-phase liquid chromatography combined with a photodiode-array detection (RP-HPLC/PDA) found that kaempferol 3-O-dihexoside and kaempferol 3-O-acyltetrahexoside accounted for 70.5% of the kaempferol derivatives. The minimum inhibitory concentration (MIC) values of the extract for all the tested reference microorganisms were high, reaching 10 mg/mL for yeasts and 20 mg/mL for bacteria. In contrast, antiviral activity was observed at 2 mg/mL, resulting in the inhibition of the HSV-1-induced cytopathic effect and the reduction in virus infectious titer by 1.96 log, as well as the viral load by 0.85 log. Among the tested prostate cancer cell lines, significant cytotoxic activity of the extract was noted only on the LNCaP cell line, with an IC_{50} value of 1.95 mg/mL. The LNCaP cell line treated with 2 mg/mL of the extract showed a noticeably reduced number of spindle-shaped cells with longer cellular projections, a significant increase in the peak corresponding to the population of apoptotic cells in the sub-G1 phase and a decreased intracellular glutathione (GSH) level, suggesting the prooxidative properties of the extract. The obtained data provide novel information about the flavonoids present in the aerial part of C. alatavicus and	Allambergenova Z., Kasela M., Adamczuk G., Humeniuk E., Iwan M., Świątek Ł., Boguszewska A., Rajtar B., Józefczyk A., Baj T., Wojtanowski K.K., Korulkin D., Kozhanova K., Ibragimova L., Sakipova Z., Tyśkiewicz K., Malm A., Skalicka-Woźniak K. Phytochemical Profile and Biological Activity of the Ethanolic Extract from the Aerial Part of Crocus alatavicus Regel & Semen Growing Wildly in Southern Kazakhstan (2022) Molecules, 27 (11), art. no. 3468 DOI: 10.3390/molecules27113468

			suggest its potential application as a source of the compounds active against HSV-1 and metastatic, androgen-sensitive prostate cancer.	
79.	Complex of hydrogels based on acrylic acid and methyl acrylate with copper ions	(2022) Materials Today: Proceedings DOI: 10.1016/j.matpr.2022.07.246	At the present time, hydrogels are utilised extensively for the purpose of removing heavy metal ions from water. However, the vast majority of chemical hydrogels are harmful to the surrounding ecosystem, and the swelling behaviours of these materials have not been sufficiently researched. Herein, by radical copolymerization in solution, we synthesized acrylic acid (AA) and methyl acrylate (MA)-based stimuli-responsive hydrogels. We studied the sorption properties of hydrogels based on AA-MA and examined the influence temperature could have on the swelling behaviour of hydrogels in different pH conditions. The structure of the hydrogel was verified using Fourier-transform infrared spectroscopy (FTIR), and the process of heavy metal adsorption was investigated. The complexing characteristics of Cu (II) ions with AA-MA based hydrogels were examined at various concentrations. Before investigating the adsorption of copper ions, the impact of gels on swelling, temperature, and pH in various mediums was investigated. In two hours, the sorption of metal ions at 20% MA was 60%, but at 10% MA, the sorption of metal ions was 80–83%. Having variable thermodynamic parameters and a high absorption efficiency for Cu (II) ions, these AA-MA based hydrogels could be an effective method for removing contamination from aqueous solutions.	Rakhmetullayeva R.K., Abutalip M., Urkimbayeva Z.R., Kanzhigitova D.K., Mangazbayeva R.A., Naushabayev A.K., Sarova N.B., Mukatayeva Z.S., Zhigerbayeva G.N. Complex of hydrogels based on acrylic acid and methyl acrylate with copper ions (2022) Materials Today: Proceedings DOI: 10.1016/j.matpr.2022.07.246
80.	Modified graft copolymers based on ethylene vinyl acetate as depressants for waxy crude oil and their effect on the rheological properties of oil	(2022) Journal of Petroleum Science and Engineering, 213, art. no. 110298 DOI: 10.1016/j.petrol.2022.110298 (Q1 in Fuel Technology)	In this work, modified ethylene-vinyl acetate (EVA)-based copolymers were synthesized by graft copolymerization of hydrophobic monomers onto commercial EVA using a low energy electron beam (EB). The mechanism of graft copolymerization was studied by the spin trap method using a model reaction of the interaction of a tert-butoxy radical with an EVA copolymer. The results show that the main contribution to the initiation of graft copolymerization is made by the reactions of hydrogen abstraction from the methine CH groups of the vinyl acetate units. Oil from the Kumkol region treated with PPD showed better rheological properties, lower pour point temperatures, as well as lower wax content when	Mun G.A., Bekbassov T., Beksultanov Z., Yermukhambetova B.B., Azhgaliyev B., Azhgaliyev N., Dergunov S.A. Modified graft copolymers based on ethylene vinyl acetate as depressants for waxy crude oil and their effect on the rheological properties of oil

			tested on a cold finger, and better performance on the transportation route of the Kumkol - Karakoin - Shymkent. Moreover, EVA-based graft copolymers (gEVAp) performed better PPD than those obtained for commercial pour-point depressant (PPD). The rheological parameters of oil have been dramatically improved, which can be characterized as better oil pumpability in the cold season, which reduces the load on mainline pumps and saves energy for the transporting company. The pour point of the tested oil dropped from 12 to −3 °C, which led to the formation of wax crystals of the regular, compact platelet shape. Field tests using pigs showed significantly less wax deposited along the pipeline.	(2022) Journal of Petroleum Science and Engineering, 213, art. no. 110298 DOI: 10.1016/j.petrol.2022.110298
81.	Influence of Chain Length of Gradient and Block Copoly(2-oxazoline)s on Self-Assembly and Drug Encapsulation	(2022) Small, 18 (17), art. no. 2106251 DOI: 10.1002/smll.202106251 (Q1 in Chemistry (miscellaneous))	Amphiphilic gradient copolymers represent a promising alternative to extensively used block copolymers due to their facile one-step synthesis by statistical copolymerization of monomers of different reactivity. Herein, an in-depth analysis is provided of micelles based on amphiphilic gradient poly(2-oxazoline)s with different chain lengths to evaluate their potential for micellar drug delivery systems and compare them to the analogous diblock copolymer micelles. Size, morphology, and stability of self-assembled nanoparticles, loading of hydrophobic drug curcumin, as well as cytotoxicities of the prepared nanoformulations are examined using copoly(2-oxazoline)s with varying chain lengths and comonomer ratios. In addition to several interesting differences between the two copolymer architecture classes, such as more compact self-assembled structures with faster exchange dynamics for the gradient copolymers, it is concluded that gradient copolymers provide stable curcumin nanoformulations with comparable drug loadings to block copolymer systems and benefit from more straightforward copolymer synthesis. The study demonstrates the potential of amphiphilic gradient copolymers as a versatile platform for the synthesis of new polymer therapeutics.	Sedlacek O., Bardoula V., Vuorimaa-Laukkanen E., Gedda L., Edwards K., Radulescu A., Mun G.A., Guo Y., Zhou J., Zhang H., Nardello-Rataj V., Filippov S., Hoogenboom R. Influence of Chain Length of Gradient and Block Copoly(2-oxazoline)s on Self-Assembly and Drug Encapsulation (2022) Small, 18 (17), art. no. 2106251 DOI: 10.1002/smll.202106251
82.	Accumulation of Secondary Metabolites of	(2022) Metabolites, 12 (7), art. no. 622	Rhodiola semenovii Boriss. (Regel and Herder) might be a promising replacement for the well-known but endangered Rhodiola rosea L. In this research, the metabolic profile of R.	Terletskaya N.V., Korbozova N.K., Grazhdannikov A.E.,

	Rhodiola semenovii Boriss. In Situ in the Dynamics of Growth and Development	DOI: 10.3390/metabo12070622 (Q2 in Biochemistry)	semenovii, including drug-active and stress-resistant components, was studied in the context of source–sink interactions in situ in the dynamics of growth and development. Gas chromatography with mass spectrometric detection and liquid chromatography methods were used. The data obtained allow for assumptions to be made about which secondary metabolites determine the level of stress resistance in R. semenovii at different stages of ontogeny in situ. For the first time, an expansion in the content of salidroside in the above-ground organs, with its maximum value during the period of seed maturation, and a significant decrease in its content in the root were revealed in the dynamics of vegetation. These results allow us to recommend collecting the ground component of R. semenovii for pharmaceutical purposes throughout the seed development stage without damaging the root system.	Seitimova G.A., Meduntseva N.D., Kudrina N.O. Accumulation of Secondary Metabolites of Rhodiola semenovii Boriss. In Situ in the Dynamics of Growth and Development (2022) Metabolites, 12 (7), art. no. 622 DOI: 10.3390/metabo12070622
83.	The Reactions of Photosynthetic Capacity and Plant Metabolites of Sedum hybridum L. in Response to Mild and Moderate Abiotic Stresses	(2022) Plants, 11 (6), art. no. 828 DOI: 10.3390/plants11060828 (Q1 in Plants Science)	In this article, for the first time, an experimental study of the effect of mild and moderate osmotic stress, NaCl content and the effect of low positive temperature on photosynthetic activity and composition of metabolites of immature plants Sedum hybridum L. is reported. In this representative of the genus Sedum adapted to arid conditions and having the properties of a succulent, a change in photosynthetic activity and an increase in the level of protective metabolites in the shoots were revealed when exposed to mild and moderate stress factors. The results of this study can be used in work on the adaptation of succulent plants to arid conditions, environmental monitoring and work on the directed induction of valuable secondary metabolites in succulents to obtain new herbal medicines.	Terletskaya N.V., Seitimova G.A., Kudrina N.O., Meduntseva N.D., Ashimuly K. The Reactions of Photosynthetic Capacity and Plant Metabolites of Sedum hybridum L. in Response to Mild and Moderate Abiotic Stresses (2022) Plants, 11 (6), art. no. 828 DOI: 10.3390/plants11060828
84.	Naturally-Occurring Bioactives in Oral Cancer: Preclinical and Clinical Studies, Bottlenecks and Future Directions	(2022) Frontiers in bioscience (Scholar edition), 14 (3), pp. 24 DOI: 10.31083/j.fbs1403024 (Q3 in Biochemistry,	Oral cancer (OC) is the eighth most common cancer, particularly prevalent in developing countries. Current treatment includes a multidisciplinary approach, involving chemo, radio, and immunotherapy and surgery, which depends on cancer stage and location. As a result of the side effects of currently available drugs, there has been an increasing interest in the search for naturally-occurring bioactives for treating all types of cancer, including OC. Thus,	Butnariu M., Quispe C., Sharifi-Rad J., Pons-Fuster E., Lopez-Jornet P., Zam W., Das T., Dey A., Kumar M., Pentea M., H Eid A., Umbetova A., Chen J.-T. Naturally-Occurring Bioactives in Oral Cancer: Preclinical and

		Genetics and Molecular Biology (miscellaneous))	this comprehensive review aims to give a holistic view on OC incidence and impact, while highlights the preclinical and clinical studies related to the use of medicinal plants for OC prevention and the recent developments in bioactive synthetic analogs towards OC management. Chemoprophylactic therapies connect the use of natural and/or synthetic molecules to suppress, inhibit or revert the transformation of oral epithelial dysplasia (DOK) into oral squamous cell carcinoma (OSCC). Novel searches have underlined the promising role of plant extracts and phytochemical compounds, such as curcumin, green tea extract, resveratrol, isothiocyanates, lycopene or genistein against this malignancy. However, poor bioavailability and lack of in vivo and clinical studies and complex pharmacokinetic profiles limit their huge potential of application. However, recent nanotechnological and related advances have shown to be promising in improving the bioavailability, absorption and efficacy of such compounds.	Clinical Studies, Bottlenecks and Future Directions (2022) Frontiers in bioscience (Scholar edition), 14 (3), pp. 24 DOI: 10.31083/j.fbs1403024
85.	Natural Compounds or Their Derivatives against Breast Cancer: A Computational Study	(2022) BioMed Research International, 2022, art. no. 5886269 DOI: 10.1155/2022/5886269 (Q2 in Biochemistry, Genetics and Moleular Biology (miscellaneous))	Background. Breast cancer is one of the most common types of cancer diagnosed and the second leading cause of death among women. Breast cancer susceptibility proteins of type 1 and 2 are human tumor suppressor genes. Genetic variations/mutations in these two genes lead to overexpression of human breast tumor suppressor genes (e.g., BRCA1, BRCA2), which triggers uncontrolled duplication of cells in humans. In addition, multidrug resistance protein 1 (MDR1), an important cell membrane protein that pumps many foreign substances from cells, is also responsible for developing resistance to cancer chemotherapy. Aim of the Study. The aim of this study was to analyze some natural compounds or their derivatives as part of the development of strong inhibitors for breast cancer. Methodology. Molecular docking studies were performed using compounds known in the literature to be effective against BRCA1 and BRCA2 and MDR1, with positive control being 5-fluorouracil, an antineoplastic drug as a positive control. Results. The binding affinity of the compounds was analyzed, and it was observed that they had a better binding affinity for the target proteins than the standard drug 5-	Hossain R., Ray P., Sarkar C., Islam M.S., Khan R.A., Khalipha A.B.R., Islam M.T., Cho W.C., Martorell M., Sharifi-Rad J., Butnariu M., Umbetova A., Calina D. Natural Compounds or Their Derivatives against Breast Cancer: A Computational Study (2022) BioMed Research International, 2022, art. no. 5886269 DOI: 10.1155/2022/5886269

			fluorouracil. Among the compounds analyzed, α-hederin, andrographolide, apigenin, asiatic acid, auricular acid, sinularin, curcumin, citrinin, hispolon, nerol, phytol, retinol palmitate, and sclareol showed the best binding affinity energy to the BRCA1, BRCA2, and MDR1 proteins, respectively. Conclusions. α-Hederin, andrographolide, apigenin, asiatic acid, auricular acid, hispolon, sclareol, curcumin, citrinin, and sinularin or their derivatives can be a good source of anticancer agents in breast cancer.	
86.	Synthesis of hydrazides of heterocyclic amines and their antimicrobial and spasmolytic activity: Synthesis of hydrazides of heterocyclic amines	(2022) Saudi Pharmaceutical Journal, 30 (7), pp. 1036 - 1043 DOI: 10.1016/j.jsps.2022.04.009 (Q2 in Pharmaceutical Science)	Un unsolvable issue of a significant number increase of drug multi resistant strains of microorganisms including Mycobacterium tuberculosis force researchers for continuous design novel pharmaceuticals. The purpose of the study is the establishment of the correlation between the structure of novel heterocyclic hydrazide derivatives and their biological activity. Several hydrazide derivatives of N-piperidinyl and N-morpholinyl and propionic acids and N-piperidinyl acetic and their derivatives were synthesized via condensation of corresponding esters with hydrazine hydrate.The structure of synthesized compounds were confirmed by the use of FTIR, H1NMR, Mass-spectroscopy and element analysis. Investigation of synthesized substances using PASS software was carried out to predict probability of pharmacological activity in silico. The antibacterial, antifungal and spasmolytic activity as well as acute toxicity of obtained compounds were evaluated in vivo. 2-(N-piperidinyl)acetic acid hydrazide and 2-methyl-3-N-piperidinyl)propanacid hydrazide revealed antibacterial and spasmolytic activities comparable to the model drugs (drotaverin) in vitro study. Synthesized compounds in in vivo experiment showed significantly low acute toxicity (LD50 520–5750 mg/kg) compared to commercially available drugs (streptomicine, ciprofloxacinum and drotaverin LD50 100–215 mg/kg). The structure- activity relationship was established that the increasing of the length of the linker between heterocyclic amine and hydrazide group results in a decrease of antimicrobial activity against studied strains (Escherichia coli, Salmonella typhymurium, Salmonella choleraesuis, Staphylococcus aureus).	Berillo D.A., Dyusebaeva M.A. Synthesis of hydrazides of heterocyclic amines and their antimicrobial and spasmolytic activity: Synthesis of hydrazides of heterocyclic amines (2022) Saudi Pharmaceutical Journal, 30 (7), pp. 1036 - 1043 DOI: 10.1016/j.jsps.2022.04.009

87.	Nigella sativa L. as a Potential Natural Product for the Treatment of COVID-19	(2022) Egyptian Journal of Chemistry, 65 (10), pp. 141 - 151. DOI: 10.21608/EJCHEM.2022.111517.5069 (Q3 in Chemistry (miscellaneous))	The world is now facing a public health emergency caused by the coronavirus pandemic (COVID-19). The World Health Organization (WHO) has called it an emerging pandemic due to its sudden appearance and distribution. Coronavirus disease 2019 (COVID-19) is a pandemic caused by the Coronavirus2 of the Extreme Acute Respiratory Syndrome (SARS-CoV2). Nigella sativa (N. sativa) (Family Ranunculaceae) is a globally used medicinal herb. Unani and Tibb, Ayurveda, and Siddha are only a few of the western medical systems that use it. N. sativa, also known as black seed, is an essential medicinal plant that has long been used as a multipurpose medicinal agent in various countries. Immune deficiency, autophagy deficiency, oxidative stress, pathological inflammation, diabetes, cardiovascular diseases, and bacterial and viral infections are all treated effectively with the essential oil and other preparations of the N. sativa crop. It comprises of many essential groups of bioactive compounds, one of which, thymoquinone, has piqued the scientific community's interest due to its active function in treating a wide variety of diseases. The therapeutic effectiveness of N. sativa, as well as recent computational results, clearly suggest that it may be used to tackle the COVID-19 pandemic that has recently arisen. The aim of this review is to highlight the therapeutic importance of N. sativa in conventional medicine, as well as the potential for its use as an antiviral agent against the SARSCoV2 virus and for further preclinical research.	Al Azzam K.M., Al Omari R.H., Aboalroub A., Bekbayeva L., Negim E.-S., Aboul-Enein H.Y. Nigella sativa L. as a Potential Natural Product for the Treatment of COVID-19 (2022) Egyptian Journal of Chemistry, 65 (10), pp. 141 - 151. DOI: 10.21608/EJCHEM.2022.111517.5069
88.	Effects of Modified Chitosan on the Physicomechanical Properties of Mortar	(2022) International Journal of Technology, 13 (1), pp. 125 - 135. DOI: 10.14716/ijtech.v13i1.4834 (Q2 in Engineering (miscellaneous))	This paper reports a study on producing admixtures from chitosan (Ch) obtained from shrimp shell treatment. The admixtures (Ch-g-AA) were based on chitosan (Ch) and acrylic acid (AA) in the following composition ratios: 65/35, 50/50, and 35/65. The grafted copolymers were synthesized using grafting polymerization and potassium persulphate as the initiator. This study investigated the properties of mortars in the presence of grafted copolymers, including setting time, workability, water absorption, and compressive strength. The results showed that grafted copolymers premixed with mortar mixes improved the properties of the mortar. However, increasing the AA ratio in the grafted copolymer decreased	Bekbayeva L., Negim E.-S., Niyazbekova R., Kaliyeva Z., Yeligbayeva G., Khatib J. The Effects of Modified Chitosan on the Physicomechanical Properties of Mortar (2022) International Journal of Technology, 13 (1), pp. 125 - 135. DOI: 10.14716/ijtech.v13i1.4834

			the W/C ratio, setting time, and water absorption, whereas the fluidity and compressive strength increased.	
89.	PHYTOCHEMICAL ANALYSIS OF SOME KAZAKHSTAN PLANT SPECIES OF THE GENUS PETROSIMONIA, FAMILY CHENOPODIACEAE [ФИТОХИМИЧЕСКИЙ АНАЛИЗ НЕКОТОРЫХ КАЗАХСТАНСКИХ ВИДОВ РАСТЕНИЯ РОДА PETROSIMONIA, СЕМЕЙСТВА МАРЕВЫХ (CHENOPODIACEAE)]	(2022) Khimiya Rastitel'nogo Syr'ya, (4), pp. 241 - 248. DOI: 10.14258/JCPRM.20220411303 (Q4 in Organic Chemistry)	The qualitative composition and quantitative content of the main groups of biologically active compounds of Kazakh plant species of the genus Petrosimonia, collected in the Almaty region, were determined. For the first time a comparative phytochemical analysis of Petrosimonia triandra (Pall.) Simonk. and Petrosimonia brachiata (Pall.) Bunge was presented. Studies of the mineral composition have been carried out. It was revealed that the content of toxic heavy metals (mercury, arsenic, cadmium, lead) in plant raw materials does not exceed the permissible standards. The content of amino acids in plant objects was studied for the first time. A high concentration among amino acids was noted for aspartic (1.246-1.286%) and glutamic acids (2.420-2.502%). This paper presents the results of the analysis of extraction processes with the maximum yield of biologically active compounds from Petrosimonia triandra by two methods: supercritical fluid CO2-extraction and maceration. Gas chromatography-mass spectrometry (GC-MS) was used for the first time in order to detect lipophilic substances in hexane and SCF CO2-extracts from P. triandra. The research results show that these extracts of P. triandra plant are promising sources for obtaining of essential oils, fatty acids and phenolic compounds. Hexane extract from the aerial part of P. triandra exhibits pronounced anti-inflammatory activity.	Seitimova G.A., Toktarbek M., Yeskaliyeva B.K., Burasheva G.Sh., Iqbal Choudhary M. PHYTOCHEMICAL ANALYSIS OF SOME KAZAKHSTAN PLANT SPECIES OF THE GENUS PETROSIMONIA, FAMILY CHENOPODIACEAE [ФИТОХИМИЧЕСКИЙ АНАЛИЗ НЕКОТОРЫХ КАЗАХСТАНСКИХ ВИДОВ РАСТЕНИЯ РОДА PETROSIMONIA, СЕМЕЙСТВА МАРЕВЫХ (CHENOPODIACEAE)] (2022) Khimiya Rastitel'nogo Syr'ya, (4), pp. 241 - 248. DOI: 10.14258/JCPRM.20220411303
90.	Propolis: An update on its chemistry and pharmacological applications	(2022) Chinese Medicine (United Kingdom), 17 (1), art. no. 100. DOI: 10.1186/s13020-022-00651-2 (Q2 in Pharmacology)	Propolis, a resinous substance produced by honeybees from various plant sources, has been used for thousands of years in traditional medicine for several purposes all over the world. The precise composition of propolis varies according to plant source, seasons harvesting, geography, type of bee flora, climate changes, and honeybee species at the site of collection. This apiary product has broad clinical applications such as antioxidant, anti-inflammatory, antimicrobial, anticancer, analgesic, antidepressant, and anxiolytic as well asimmunomodulatory effects. It is also well known from traditional uses in treating purulent disorders, improving the wound healing, and alleviating many of the related	Hossain R., Quispe C., Khan R.A., Saikat A.S.M., Ray P., Ongalbek D., Yeskaliyeva B., Jain D., Smeriglio A., Trombetta D., Kiani R., Kobarfard F., Mojgani N., Saffarian P., Ayatollahi S.A., Sarkar C., Islam M.T., Keriman D., Uçar A., Martorell M., Sureda A., Pintus G., Butnariu M., Sharifi-Rad J., Cho W.C.

			discomforts. Even if its use was already widespread since ancient times, after the First and Second World War, it has grown even more as well as the studies to identify its chemical and pharmacological features, allowing to discriminate the qualities of propolis in terms of the chemical profile and relative biological activity based on the geographic place of origin. Recently, several in vitro and in vivo studies have been carried out and new insights into the pharmaceutical prospects of this bee product in the management of different disorders, have been highlighted. Specifically, the available literature confirms the efficacy of propolis and its bioactive compounds in the reduction of cancer progression, inhibition of bacterial and viral infections as well as mitigation of parasitic-related symptoms, paving the way to the use of propolis as an alternative approach to improve the human health. However, a more conscious use of propolis in terms of standardized extracts as well as new clinical studies are needed to substantiate these health claims.	Propolis: An update on its chemistry and pharmacological applications (2022) Chinese Medicine (United Kingdom), 17 (1), art. no. 100. DOI: 10.1186/s13020-022-00651-2
91.	Multi-Target Mechanisms of Phytochemicals in Alzheimer's Disease: Effects on Oxidative Stress, Neuroinflammation and Protein Aggregation	(2022) Journal of Personalized Medicine, 12 (9), art. no. 1515. DOI: 10.3390/jpm12091515 (Q2 in Medicine (miscellaneous))	Alzheimer's disease (AD) is a neurodegenerative disease characterized by a tangle-shaped accumulation of beta-amyloid peptide fragments and Tau protein in brain neurons. The pathophysiological mechanism involves the presence of Aβ-amyloid peptide, Tau protein, oxidative stress, and an exacerbated neuro-inflammatory response. This review aims to offer an updated compendium of the most recent and promising advances in AD treatment through the administration of phytochemicals. The literature survey was carried out by electronic search in the following specialized databases PubMed/Medline, Embase, TRIP database, Google Scholar, Wiley, and Web of Science regarding published works that included molecular mechanisms and signaling pathways targeted by phytochemicals in various experimental models of Alzheimer's disease in vitro and in vivo. The results of the studies showed that the use of phytochemicals against AD has gained relevance due to their antioxidant, anti-neuroinflammatory, anti-amyloid, and anti-hyperphosphorylation properties of Tau protein. Some	Sharifi-Rad J., Rapposelli S., Sestito S., Herrera-Bravo J., Arancibia-Diaz A., Salazar L.A., Yeskaliyeva B., Beyatli A., Leyva-Gómez G., González-Contreras C., Gürer E.S., Martorell M., Calina D. Multi-Target Mechanisms of Phytochemicals in Alzheimer's Disease: Effects on Oxidative Stress, Neuroinflammation and Protein Aggregation (2022) Journal of Personalized Medicine, 12 (9), art. no. 1515. DOI: 10.3390/jpm12091515

			bioactive compounds from plants have been shown to have the ability to prevent and stop the progression of Alzheimer's.	
92.	Bioactive Effects of Curcumin in Human Immunodeficiency Virus Infection Along with the Most Effective Isolation Techniques and Type of Nanoformulations	(2022) International Journal of Nanomedicine, 17, pp. 3619 - 3632. DOI: 10.2147/IJN.S364501 (Q1 in Organic Chemistry)	Human immunodeficiency virus (HIV) is one of the leading causes of death worldwide, with African countries being the worst affected by this deadly virus. Curcumin (CUR) is a Curcuma longa-derived polyphenol that has attracted the attention of researchers due to its antimicrobial, anti-inflammatory, antioxidant, immunomodulatory and antiviral effects. CUR also demonstrates anti-HIV effects by acting as a possible inhibitor of gp120 binding, integrase, protease, and topoisomerase II activities, besides also exerting a protective action against HIV-associated diseases. However, its effectiveness is limited due to its poor water solubility, rapid metabolism, and systemic elimination. Nanoformulations have been shown to be useful to enhance curcumin's bioavailability and its effectiveness as an anti-HIV agent. In this sense, bioactive effects of CUR in HIV infection are carefully reviewed, along with the most effective isolation techniques and type of nanoformulations available.	Butnariu M., Quispe C., Koirala N., Khadka S., Salgado-Castillo C.M., Akram M., Anum R., Yeskaliyeva B., Cruz-Martins N., Kumar M.M.M., Bagiu R.V., Razis A.F.A., Sunusi U., Kamal R.M., Sharifi-Rad J. Bioactive Effects of Curcumin in Human Immunodeficiency Virus Infection Along with the Most Effective Isolation Techniques and Type of Nanoformulations (2022) International Journal of Nanomedicine, 17, pp. 3619 - 3632. DOI: 10.2147/IJN.S364501
93.	Pharmacological Properties of Bergapten: Mechanistic and Therapeutic Aspects	(2022) Oxidative Medicine and Cellular Longevity, 2022, art. no. 8615242. DOI: 10.1155/2022/8615242 (Q1 in Biochemistry)	Bergapten (BP) or 5-methoxypsoralen (5-MOP) is a furocoumarin compound mainly found in bergamot essential oil but also in other citrus essential oils and grapefruit juice. This compound presents antibacterial, anti-inflammatory, hypolipemic, and anticancer effects and is successfully used as a photosensitizing agent. The present review focuses on the research evidence related to the therapeutic properties of bergapten collected in recent years. Many preclinical and in vitro studies have been evidenced the therapeutic action of BP; however, few clinical trials have been carried out to evaluate its efficacy. These clinical trials with BP are mainly focused on patients suffering from skin disorders such as psoriasis or vitiligo. In these trials, the administration of BP (oral or topical) combined with UV irradiation induces relevant lesion clearance rates. In addition, beneficial effects of bergamot extract were also observed in patients with altered serum lipid profiles and in people with nonalcoholic fatty liver. On the contrary, there are no clinical trials that investigate the	Quetglas-Llabrés M.M., Quispe C., Herrera-Bravo J., Catarino M.D., Pereira O.R., Cardoso S.M., Dua K., Chellappan D.K., Pabreja K., Satija S., Mehta M., Sureda A., Martorell M., Satmbekova D., Yeskaliyeva B., Sharifi-Rad J., Rasool N., Butnariu M., Bagiu I.C., Bagiu R.V., Calina D., Cho W.C. Pharmacological Properties of Bergapten: Mechanistic and Therapeutic Aspects (2022) Oxidative Medicine and Cellular Longevity, 2022, art. no. 8615242. DOI: 10.1155/2022/8615242

			possible effects on cancer. Although the bioavailability of BP is lower than that of its 8-methoxypsoralen (8-MOP) isomer, it has fewer side effects allowing higher concentrations to be administered. In conclusion, although the use of BP has therapeutic applications on skin disorders as a sensitizing agent and as components of bergamot extract as hypolipemic therapy, more trials are necessary to define the doses and treatment guidelines and its usefulness against other pathologies such as cancer or bacterial infections.	
94.	Neuroprotective and anti-epileptic potentials of genus Artemisia L.	(2022) Frontiers in Pharmacology, 13, art. no. 1021501. DOI: 10.3389/fphar.2022.1021501 (Q1 in Pharmacology)	The Genus Artemisia L. is one of the largest genera in the Asteraceae family growing wild over in Europe, North America, and Central Asia and has been widely used in folk medicine for the treatment of various ailments. Phytochemical and psychopharmacological studies indicated that the genus Artemisia extracts contain various antioxidant and anti-inflammatory compounds and possess antioxidant, anti-inflammatory, antimicrobial, antimalarial, and antitumor activity. Recently, increasing experimental studies demonstrated that many Artemisia extracts offer a great antiepileptic potential, which was attributed to their bioactive components via various mechanisms of action. However, detailed literature on the antiepileptic properties of the genus Artemisia and its mechanism of action is segregated. In this review, we tried to gather the detailed neuroprotective and antiepileptic properties of the genus Artemisia and its possible underlying mechanisms. In this respect, 63 articles were identified in the PubMed and Google scholars databases, from which 18 studies were examined based on the pharmacological use of the genus Artemisia species in epilepsy. The genus Artemisia extracts have been reported to possess antioxidant, anti-inflammatory, neurotransmitter-modulating, anti-apoptotic, anticonvulsant, and pro-cognitive properties by modulating oxidative stress caused by mitochondrial ROS production and an imbalance of antioxidant enzymes, by protecting mitochondrial membrane potential required for ATP production, by upregulating GABA-A receptor and nACh receptor activities, and by interfering with various anti-inflammatory and anti-apoptotic signaling pathways, such as mitochondrial apoptosis pathway,	Sailike B., Omarova Z., Jenis J., Adilbayev A., Akbay B., Askarova S., Jin W.-L., Tokay T. Neuroprotective and anti-epileptic potentials of genus Artemisia L. (2022) Frontiers in Pharmacology, 13, art. no. 1021501. DOI: 10.3389/fphar.2022.1021501

			ERK/CREB/Bcl-2 pathway and Nrf2 pathway. This review provides detailed information about some species of the genus Artemisia as potential antiepileptic agents. Hence, we recommend further investigations on the purification and identification of the most biological effective compounds of Artemisia and the mechanisms of their action to cure epilepsy and other neurological diseases.	
95.	Secondary Metabolites and Their Cytotoxic Activity of Artemisia nitrosa Weber. and Artemisia marschalliana Spreng.	(2022) Molecules, 27 (22), art. no. 8074. DOI: 10.3390/molecules27228074 (Q1 in Chemistry (miscellaneous))	As a promising source of biologically active substances, the Artemisia species from Kazakhstan have not been investigated efficiently. Considering the rich history, medicinal values, and availability of the Artemisia plants, systematic investigations of two Artemisia species growing in the East Kazakhstan region were conducted. In this study, one new germacrane-type sesquiterpene lactone (11), together with 10 known sesquiterpenes and its dimer, were characterized from A. nitrosa Weber. Additionally, one new chromene derivative (1') with another 12 known compounds, including coumarins, sesquiterpene diketones, phenyl propanoids, polyacetylenics, dihydroxycinnamic acid derivatives, fatty acids, naphthalene derivatives, flavones, and caffeic acid derivatives were isolated from A. marschalliana Spreng. All compounds were isolated and identified for the first time from these two Artemisia species. The structures of new compounds (11, 1') were established by using UV, TOFMS, LC–MS, 1D and 2D NMR spectroscopic analyses. The cytotoxicity of all isolated compounds was evaluated. As a result, all compounds did not show significant inhibition against HL-60 and A-549 cell lines. The sesquiterpenoids isolated from A. nitrosa were tested for their inhibitory activity against the LPS-induced NO release from the RAW624.7 cells, and neither of them exhibited significant activity.	Kazymbetova A., Amangeldi M., Nurlybekova A., Amzeyeva U., Baktybala K., Tang C.-P., Ke C.-Q., Yao S., Ye Y., Jenis J. Secondary Metabolites and Their Cytotoxic Activity of Artemisia nitrosa Weber. and Artemisia marschalliana Spreng. (2022) Molecules, 27 (22), art. no. 8074. DOI: 10.3390/molecules27228074
96.	Immunomodulatory Effects of Plant Extracts from Salvia deserta Schang. and Salvia sclarea L.	(2022) Plants, 11 (20), art. no. 2690. DOI: 10.3390/plants11202690 (Q1 in Plants Science)	Medicines, their safety, effectiveness and quality are indispensable factors of national security, important on a global scale. The COVID-19 pandemic has once again emphasized the importance of improving the immune response of the body in the face of severe viral infections. Plants from the Salvia L. genus have long been used in traditional medicine for treatment of inflammatory processes,	Zhussupova A., Zhumaliyeva G., Ogay V., Issabekova A., Ross S.A., Zhusupova G.E. Immunomodulatory Effects of Plant Extracts from Salvia deserta Schang. and Salvia sclarea L.

			parasitic diseases, bacterial and viral infections. The aim of the current study was to evaluate the immunomodulatory effects of plant extracts LS-1, LS-2 from Salvia deserta Schang. and LS-3, LS-4 from Salvia sclarea L. plants growing in southern Kazakhstan by conventional and ultrasonic-assisted extraction, respectively. The cytotoxic effects of the named sage extracts on neonatal human dermal fibroblasts (HDFn) were evaluated using the MTT assay. Immunomodulatory effects of the studied extracts were compared by examining their influence on pro-inflammatory cytokine secretion and phagocytic activity of murine immune cells. Depending on the physiological state of the innate immune cells, sage extracts LS-2 and LS-3 had either a stimulating effect on inactivated macrophages or suppressed cytokine-producing activity in LPS-activated macrophages. The greatest increase in TNF-α secretion was found after treatment of spleen T lymphocytes with sage extract LS-2, obtained by ultrasonic-assisted extraction.	(2022) Plants, 11 (20), art. no. 2690. DOI: 10.3390/plants11202690
97.	Maleimide-Decorated PEGylated Mucoadhesive Liposomes for Ocular Drug Delivery	(2022) Langmuir, 38 (45), pp. 13870 - 13879. DOI: 10.1021/acs.langmuir.2c02086 (Q1 in Materials Science (miscellaneous))	Liposomes are promising spherical vesicles for topical drug delivery to the eye. Several types of vesicles were formulated in this study, including conventional, PEGylated, and maleimide-decorated PEGylated liposomes. The physicochemical characteristics of these liposomes, including their size, zeta potential, ciprofloxacin encapsulation efficiency, loading capacity, and release, were evaluated. The structure of these liposomes was examined using dynamic light scattering, transmission electron microscopy, and small angle neutron scattering. The ex vivo corneal and conjunctival retention of these liposomes were examined using the fluorescence flow-through method. Maleimide-decorated liposomes exhibited the best retention performance on bovine conjunctiva compared to other types of liposomes studied. Poor retention of all liposomal formulations was observed on bovine cornea.	Moiseev R.V., Kaldybekov D.B., Filippov S.K., Radulescu A., Khutoryanskiy V.V. Maleimide-Decorated PEGylated Mucoadhesive Liposomes for Ocular Drug Delivery (2022) Langmuir, 38 (45), pp. 13870 - 13879. DOI: 10.1021/acs.langmuir.2c02086
98.	INFLUENCE OF POLYVINYL ALCOHOL-BASED COPOLYMERS ON	(2022) Journal of Chemical Technology and Metallurgy, 57 (6),	The physical and chemical features of diatomite burnout and reinforcing additives (husk and perlite), modified by water-soluble copolymers based on polyvinyl alcohol, starch, and acrylic acid, are presented in this study. Depending on the	Urkimbayeva P.I., Bakytzhanuly B., Tugelbayeva L.M., Al Azzam K.M., Yespenbetova Sh.O., Mun

	THE PHYSICO-MECHANICAL PROPERTIES OF THE THERMAL INSULATION MATERIALS	pp. 1122 - 1128. (Q3 in Chemical Engineering (miscellaneous))	polymer concentration, linear shrinkage, density, compressive and bending strength limitations, and thermal conductivity coefficients were calculated. Polymer additives have been shown to improve nearly all the stated properties of thermal insulation materials. The materials developed are useful in the production of rigid thermal insulation products for use in power engineering. The use of PVA-based polymers: starch: acrylic acid copolymers have a significant influence on the physico-mechanical characteristics of diatomaceous earth-based heat-insulating composites. When the polymer content is increased to 1 %, the linear shrinkage coefficients decrease from 14.8 to 2.5 %, the compressive strength limits increase from 1.5 to 5.6 MPa, the flexural bending strength limits increase from 0.2 to 2.4 MPa, and the thermal conductivity coefficients decrease from 0.068 to 0.0484 W/m.K	G.A., Kenessova Z.A., Dilmukhambetov E.E., Negim E.-S. INFLUENCE OF POLYVINYL ALCOHOL-BASED COPOLYMERS ON THE PHYSICO-MECHANICAL PROPERTIES OF THE THERMAL INSULATION MATERIALS (2022) Journal of Chemical Technology and Metallurgy, 57 (6), pp. 1122 - 1128.
99.	Bionanocomposite Films Based on Chitosan with Bentonite Clay and Polyvinyl Alcohol	(2022) Eurasian Chemico-Technological Journal, 24 (4), pp. 267 - 275. DOI: 10.18321/ectj1470 (Q3 in Chemistry (miscellaneous))	Nanocomposite films based on chitosan nanowhisker (CsW) with ionic and nonorganic polymers were prepared and studied on the swelling and mechanical properties. Chitosan nanowhiskers were made from α-chitin by using a top-down approach. Ionic polymer polyvinyl alcohol (PVA) and nonorganic bentonite clay (BC) were employed to prepare chitosan nanowhisker bionanocomposite film taking into account their biocompatibility and nontoxicity. Fourier transform infrared spectroscopy analysis, swelling degree measurements and mechanical tests were employed to analyze the influence of significant PVA and bentonite amounts on the film properties. The mechanical strength was found to increase with the rise of the PVA concentration. This is an advantage for producing wound dressing material. The increase in BC concentration in the film resulted in high film stability in water and different mediums and in higher water absorbance than that of CsW/PVA film. However, the highest swelling degree was for a film of CsW itself but the mechanical strength was lower and insufficient to use it for the wound dressing material. Thus, the incorporation of PVA and BC into chitosan nanowhisker can enhance the swelling capacity and mechanical strength.	Baimyrza P.A., Iminova R.S., Kudaibergenova B.M., Kairalapova G.Zh. Bionanocomposite Films Based on Chitosan with Bentonite Clay and Polyvinyl Alcohol (2022) Eurasian Chemico-Technological Journal, 24 (4), pp. 267 - 275. DOI: 10.18321/ectj1470

100.	Novel Complexes of 3-[3-(1H-Imidazol-1-yl)propyl]-3,7-diaza-bispidines and β-Cyclodextrin as Coatings to Protect and Stimulate Sprouting Wheat Seeds	(2022) Molecules, 27 (21), art. no. 7406. DOI: 10.3390/molecules27217406 (Q1 in Chemistry (miscellaneous))	We report the syntheses and characterization of novel 3,7-bicycl[3.3.1]bispidines possessing an imidazolpropyl group attached to N-3, and at N-7 a Boc group, as well as a benzoylated-oximated group at C-9. These compounds were complexed with β-cyclodextrin [β-CD] and evaluated as seed protectors of selected wheat seedlings. Using strong acid, condensations of N-substituted piperidones with the appropriate imidazolpropyl groups at N-3 and N-7 led to bispidinones 6 and 7. These intermediates were reduced to the corresponding 3,7-diazabicyclo[3.3.1]nonane targets. The oxime at C-9 was benzoylated to yield 13. Heating these 3,7-diazabicyclo[3.3.1]nonanes in ethanol with β-CD generated the complexes required. We investigated the ability of such complexes as coatings on seedlings to protect and stimulate growth of three varieties of wheat, namely Kazakhstanskaya-10, Severyanka, and Miras. The complex of 3-[3-(1H-imidazol-1-yl)propyl]-7-(3-methoxypropyl)-3,7-diazabicyclo[3.3.1]nonane (2) promoted growth in the root systems of all three wheat varieties by more than 30% in Kazakhstanskaya-10, 30% in Severyanka and 8.5% in Miras. A complex of 3-Boc-7-[3-(1H-imidazol-1-yl)propyl]-3,7-diazabicyclo[3.3.1]nonane (9) increased both shoot and root length in only the Severyanka variety. The complex of 3-(3-butoxypropyl)-7-[3-(1H-imidazol-1-yl)propyl]-3,7-diazabicyclo[3.3.1]nonane (11) stimulated both shoot growth (0.8%, 12.3%, 13.5%) and root growth (12.3%, 9.4%, 21.7%) in all three varieties of wheat, respectively. The nature of substituents on the bispidine affect the activity. Solid complexes (1:1) were generated as powders which melted above 240 °C (dec) and were characterized via elemental analyses as 1:1 complexes.	Kaldybayeva A.B., Yu V.K., Malmakova A.E., Li T., Ten A.Y., Seilkhanov T.M., Praliyev K.D., Berlin K.D. Novel Complexes of 3-[3-(1H-Imidazol-1-yl)propyl]-3,7-diaza-bispidines and β-Cyclodextrin as Coatings to Protect and Stimulate Sprouting Wheat Seeds (2022) Molecules, 27 (21), art. no. 7406. DOI: 10.3390/molecules27217406
101.	Anticancer Cytotoxic Activity of Bispidine Derivatives Associated with the Increasing Catabolism of Polyamines	(2022) Molecules, 27 (12), art. no. 3872. DOI: 10.3390/molecules27123872 (Q1 in Chemistry (miscellaneous))	Polyamine (PA) catabolism is often reduced in cancer cells. The activation of this metabolic pathway produces cytotoxic substances that might cause apoptosis in cancer cells. Chemical compounds able to restore the level of PA catabolism in tumors could become potential antineoplastic agents. The search for activators of PA catabolism among bicyclononan-9-ones is a promising strategy for drug development. The aim of the study was to evaluate the	Neborak E.V., Kaldybayeva A.B., Bey L., Malmakova A.Y., Tveritinova A.S., Hilal A., Yu V.K., Ploskonos M.V., Komarova M.V., Agostinelli E., Zhdanov D.D. Anticancer Cytotoxic Activity of Bispidine Derivatives

			biological activity of new 3,7-diazabicyclo[3.3.1]nonan-9-one derivatives that have antiproliferative properties by accelerating PA catabolism. Eight bispidine derivatives were synthetized and demonstrated the ability to activate PA catabolism in regenerating rat liver homogenates. However, only three of them demonstrated a potent ability to decrease the viability of cancer cells in the MTT assay. Compounds 4c and 4e could induce apoptosis more effectively in cancer HepG2 cells rather than in normal WI-38 fibroblasts. The lead compound 4e could significantly enhance cancer cell death, but not the death of normal cells if PAs were added to the cell culture media. Thus, the bispidine derivative 4e 3-(3-methoxypropyl)-7-[3-(1H-piperazin-1-yl)ethyl]-3,7-diazabicyclo[3.3.1]nonane could become a potential anticancer drug substance whose mechanism relies on the induction of PA catabolism in cancer cells.	Associated with the Increasing Catabolism of Polyamines (2022) Molecules, 27 (12), art. no. 3872. DOI: 10.3390/molecules27123872
102.	Antihypothyroid Effect of Salidroside	(2022) Molecules, 27 (21), art. no. 7487. DOI: 10.3390/molecules27217487 (Q1 in Chemistry (miscellaneous))	In terms of prevalence, thyroid pathology, associated both with a violation of the gland function and changes in its structure, occupies one of the main places in clinical endocrinology. The problem of developing low-toxic and highly effective herbal preparations for the correction of thyroid hypofunction and its complications is urgent. Salidroside is a glucoside of tyrosol, found mostly in the roots of Rhodiola spp., and has various positive biological activities. The purpose of this study was to study the antihypothyroid potential of salidrosid-containing extract from R. semenovii roots, which was evaluated on a mercazolyl hypothyroidism model. We showed that extract containing salidroside is a safe and effective means of hypothyroidism correction, significantly reducing ($p \leq 0.001$) the level of thyroid-stimulating hormone and increasing the level of thyroid hormones. The combined use of R. semenovii extract with potassium iodide enhances the therapeutic effect of the extract by 1.3-times.	Korbozova N.K., Kudrina N.O., Zhukova N.A., Grazhdannikov A.E., Blavachinskaya I.V., Seitimova G.A., Kulmanov T.E., Tolstikova T.G., Terletskaya N.V. Antihypothyroid Effect of Salidroside (2022) Molecules, 27 (21), art. no. 7487. DOI: 10.3390/molecules27217487
103.	Natural essential oils as a new therapeutic tool in colorectal cancer	(2022) Cancer Cell International, 22 (1), art. no. 407.	Colorectal cancer (CRC) is the third most revalent type of cancer in the world and the second most common cause of cancer death (about 1 million per year). Historically, natural compounds and their structural analogues have contributed	Garzoli S., Alarcón-Zapata P., Seitimova G., Alarcón-Zapata B., Martorell M., Sharopov F., Fokou P.V.T., Dize D., Yamthe

		DOI: 10.1186/s12935-022-02806-5 (Q2 in Cancer Research)	to the development of new drugs useful in the treatment of various diseases, including cancer. Essential oils are natural odorous products made up of a complex mixture of low molecular weight compounds with recognized biological and pharmacological properties investigated also for the prevention and treatment of cancer. The aim of this paper is to highlight the possible role of essential oils in CRC, their composition and the preclinical studies involving them. It has been reviewed the preclinical pharmacological studies to determine the experimental models used and the anticancer potential mechanisms of action of natural essential oils in CRC. Searches were performed in the following databases PubMed/Medline, Web of science, TRIP database, Scopus, Google Scholar using appropriate MeSH terms. The results of analyzed studies showed that EOs exhibited a wide range of bioactive effects like cytotoxicity, antiproliferative, and antimetastatic effects on cancer cells through various mechanisms of action. This updated review provides a better quality of scientific evidence for the efficacy of EOs as chemotherapeutic/chemopreventive agents in CRC. Future translational clinical studies are needed to establish the effective dose in humans as well as the most suitable route of administration for maximum bioavailability and efficacy. Given the positive anticancer results obtained from preclinical pharmacological studies, EOs can be considered efficient complementary therapies in chemotherapy in CRC.	L.R.T., Les F., Cásedas G., López V., Iriti M., Rad J.S., Gürer E.S., Calina D., Pezzani R., Vitalini S. Natural essential oils as a new therapeutic tool in colorectal cancer (2022) Cancer Cell International, 22 (1), art. no. 407. DOI: 10.1186/s12935-022-02806-5
104.	New Approaches to Chemical Technologies of Plant Materials for Aromatherapy	(2022) Eurasian Chemico-Technological Journal, 24 (4), pp. 331 - 339. DOI: 10.18321/ectj1477 (Q3 in Chemistry (miscellaneous))	A new approach to the production of commercial products used in aromatherapy and household aromatizing agents based on induction heating of plant raw materials and the use of hydrophilic polymer hydrogels is proposed. It is shown that obtaining highly purified essential oils is neither technologically nor economically justified from the point of view of their use in aromatherapy. The proposed approach makes it possible to obtain products for aromatherapy with minimal processing of raw materials and low production costs. The main end product is a polymer hydrogel saturated with a liquid phase formed during induction heating of a mixture of a plant component with metal inclusions. Such a product, among other things, allows the implementation of	Kabdushev S.B., Agibayeva L.E., Kadyrzhan K.N., Bakirov A.S., Seitimova G.A., Kolushpayeva A.T., Mun A.G. New Approaches to Chemical Technologies of Plant Materials for Aromatherapy (2022) Eurasian Chemico-Technological Journal, 24 (4), pp. 331 - 339. DOI: 10.18321/ectj1477

			electronic aromatherapy systems and household aromatizing agents, in which the generation of aroma oils is also provided by induction heating. In the operation of such systems, the basic property of thermosensitive hydrogels is used – a shift in the hydrophobic-hydrophilic balance with temperature variations, which makes it possible to exclude parasitic evaporation of volatile components. Specific technical solutions that implement this approach are proposed.	
105.	Modified Carbon Sorbents Based on Walnut Shell for Sorption of Toxic Gases	DOI:10.1007/s10891-022-02607-7	The results of synthesis on the basis of nanocarbon for protection against a broad range of toxic chemical substances are presented. The analysis of the specimens' structure shows that activation contributes to the formation of a great number of small pores and the development of a porous texture of sorbents, which leads to an increase in the specific surface. Activated specimens have a micromesoporosity confirmed by appropriate isotherms of low-temperature adsorption of nitrogen. It is shown that the procedure of activation results in specimens with various acidity, and this surface property has a marked effect on the characteristics of materials. The results of investigation of the breakthrough time for vapors of inorganic and organic substances show that Cu and Co ion impregnations are the most suitable for the production of a universal sorbent. Due to this, this paper presents the technology of obtaining activated charcoals impregnated with ions of various metals that can surpass sorption properties of commercial reference materials.	Mansurov Z.A., Velasco L.F., Lodewyckx P., Doszhanov E.O., Azat S. Modified Carbon Sorbents Based on Walnut Shell for Sorption of Toxic Gases // Journal of Engineering Physics and Thermophysics, 2022. –Vol.95. -No6. –P.1383-1392 Doi: 10.1007/s10891-022-02607-7 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85143242425&doi=10.1007%2fs10891-022-02607-7&partnerID=40&md5=90e60bb08900d7362acc5bdd0e301bbd
106.	Effectiveness of Bio-Waste-Derived Carbon Doping on De-Icing Performance of an Electrically Resistant Concrete	DOI:10.3390/coatings12111629	This paper proposes a modified carbon-based concrete filler composition, which can potentially be used as a self-de-icing pavement. Carbon fibers (CNFs), graphene-like porous carbon (GLC), and a CNF/GLC composite were developed to reinforce concrete with the aim to improve its electrical conductivity and mechanical properties. The effect of the CNF and GLC loadings on the electrical conductivity of the filled concrete was evaluated in a climatic chamber at temperatures simulating water-freezing conditions on a concrete road. The results show that even a negligible loading (0.2 wt.%) of concrete with CNF/GLC results in a	Bakbolat B., Daulbayev C., Sultanov F., Taurbekov A., Tolynbekov A., Yeleuov M., Korobeinyk A.V., Mansurov Z. Effectiveness of Bio-Waste-Derived Carbon Doping on De-Icing Performance of an Electrically Resistant Concrete // Coatings, 2022. –Vol.12. –No11.

			dramatic decrease in its resistance when compared to the same loadings for CNF and GLC added separately. Depending on the number of fillers, the temperature of the modified concrete samples reached up to +19.8 °C at low voltage (10 V) at −10 °C, demonstrating the perspective of their heat output for anti-icing applications. Additionally, this study shows that adding 2.0 wt.% of the CNF/GLC composite to the concrete improves its compressive strength by 33.93% compared to the unmodified concrete.	Doi: 10.3390/coatings12111629 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85141830095&doi=10.3390%2fcoatings12111629&partnerID=40&md5=8ece7ca062a20c8277902d8303b9b4b8
107.	Gas Sensitive Materials Based on Polyacrylonitrile Fibers and Nickel Oxide Nanoparticles	DOI:10.3390/jcs6110326	The results of the synthesis of PAN/NiO composite fibers by the electrospinning method are presented. The electrospinning installation included a rotating drum collector for collecting fibers. Nickel oxide nanoparticles were synthesized by solution combustion synthesis from nickel nitrate and urea. It was shown that monophase NiO nanoparticles with average particle sizes of 154 nm could be synthesized by this method. NiO nanoparticles were investigated by X-ray diffraction analysis and scanning electron microscopy. Based on NiO nanoparticles, composite PAN/NiO fibers were obtained by electrospinning. The obtained composite fibers were modified with heat treatment (stabilization and carbonization) processes. Obtained C/NiO fibers were investigated by SEM, and EDAX. It was shown that obtained composite fibers could be used for the detection of acetone and acetylene in air. These results show that C/NiO based electrospun fibers have potential applications in gas sensors.	Kaidar B., Smagulova G., Imash A., Mansurov Z. Gas Sensitive Materials Based on Polyacrylonitrile Fibers and Nickel Oxide Nanoparticles // Journal of Composites Science, 2022. –Vol.6. -No11. –P.326 Doi:10.3390/jcs6110326 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85141785865&doi=10.3390%2fjcs6110326&partnerID=40&md5=d77b61682fd964cdbb6a17eca8f47b53
108.	Biomass-Derived Porous Carbon Materials for Li-Ion Battery	DOI:10.3390/nano12203710	Biomass-based carbon nanofibers (CNF) were synthesized using lignin extracted from sawdust and polyacrylonitrile (PAN) (30:70) with the help of the electrospinning method and subsequent stabilization at 220 °C and carbonization at 800, 900, and 1000 °C. The synthesized CNFs were studied by scanning electron microscopy, energy-dispersive X-ray analysis, Raman spectroscopy, and the Brunauer–Emmett–Teller method. The temperature effect shows that CNF carbonized at 800 °C has excellent stability at different current densities and high capacitance. CNF 800 in the first test cycle at a current density of 100 mA/g shows an initial	Nazhipkyzy M., Maltay A.B., Askaruly K., Assylkhanova D.D., Seitkazinova A.R., Mansurov Z.A. Biomass-Derived Porous Carbon Materials for Li-Ion Battery // Nanomaterials, 2022. –Vol.12. -No20. –P.3710 Doi:10.3390/nano12203710 https://www.scopus.com/inward/record.uri?eid=2-s2.0-

			capacity of 798 mAh/g and an initial coulomb efficiency of 69.5%. The CNF 900 and 1000 show an initial capacity of 668 mAh/g and 594 mAh/g, and an initial Coulomb efficiency of 52% and 51%. With a long cycle (for 500 cycles), all three samples at a current density of 500 mA/g show stable cycling in different capacities (CNF 800 in the region of 300–400 mAh/g, CNF 900 and 1000 in the region of 100–200 mAh/g).	85140899636&doi=10.3390%2fnano12203710&partnerID=40&md5=263761749af64ddad17bfa36d39fa296
109.	Selection of Solvents for the Removal of Asphaltene–Resin–Paraffin Deposits	DOI:10.3390/pr10071262	In this study, we aimed to select the optimal solvents for the removal of asphaltene–resin–paraffin deposits. The effectiveness of various solvents was determined based on the asphaltene–resin–paraffin deposits (ARPDs) of the Zhanaozen (Ozen) crude oil field. These deposits affect the geological, physical, and technological conditions of the oil field, thus influencing its development. According to the results, we found that the most effective composite solvent is a composition comprising a 50% gasoline fraction and a 50% kerosene fraction. This composition showed mass loss of deposits of 97.7% and a dissolving power of 93.5 g/cm3 after 5 h. We confirmed the effectiveness of this composition by the paraffinic type of the deposits, which is explained by the high content of paraffin in the oil from the Zhanaozen field. Aromatic solvents showed a relatively low dissolving power compared with aliphatic solvents, which also confirms the low content of resins and asphaltenes in the ARPD.	Tanirbergenova S., Ongarbayev Y., Tileuberdi Y., Zhambolova A., Kanzharkan E., Mansurov Z., Selection of Solvents for the Removal of Asphaltene–Resin– Paraffin Deposits // Processes, 2022. –Vol.10. -No7. –P.1262. DOI:10.3390/pr10071262 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85133298477&doi=10.3390%2fpr10071262&partnerID=40&md5=4db5f13603bf26373fe47ab231ce1945
110.	A comprehensive review of template-assisted porous carbons: Modern preparation methods and advanced applications	DOI:10.1016/j.mser.2022.100682	Carbons with hierarchical pores in the range of few nanometers obtained via template-assisted methods offer a great control over structure and geometry of pores, keeping them uniformly distributed and better connected. Another advantage is the easy functionalization of templated porous carbons (TPCs) by various dopants, which makes them excellent materials for catalysis, energy storage and conversion, sensors and environmental applications. Herein, beyond zeolite-templated carbons, key methodologies based on the template material such as organic and metal oxides, silica, polymers, metal-organic framework (MOFs) and bio-originated materials used for the preparation of porous carbons possessing predetermined structure and composition, have been reviewed. The effects of precursor	Pavlenko V., Khosravi H S., Żółtowska S., Haruna A.B., Zahid M., Mansurov Z., Supiyeva Z., Galal A., Ozoemena K.I., Abbas Q., Jesionowski T. A comprehensive review of template-assisted porous carbons: Modern preparation methods and advanced applications // Materials Science and Engineering R: Reports, 2022. –Vol.149. -No100682.

			material on the textural and structural properties of TPCs have been described. In scope of applying novel methods such as evaporation induced self-assembling (EISA), the influence of different templates on the properties of resulting materials has been discussed. Further, advances on the template-induced synthesis of self-supporting metal-organic frameworks and their utilization as advanced templates have been described. Moreover, self-templates are especially emphasized, application of which in our opinion can provide a sustainable large-scale production of TPCs. The recent progress in the study of the diffusional processes, energy and biomedical applications as well as the confinement effects of different liquids and proteins within the porous matrices of template-derived carbons, have been reviewed.	Doi:10.1016/j.mser.2022.100682 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85133893258&doi=10.1016%2fj.mser.2022.100682&partnerID=40&md5=53008048a2acbdc0d6ecaadec2bf5984
111.	Aging Process Effects on the Characteristics of Vacuum Residue Oxidation Products with the Addition of Crumb Rubber	DOI:10.3390/molecules27103284	This paper considers the effect of aging processes on viscoelastic characteristics of vacuum residue oxidation products modified with crumb rubber. Viscoelastic properties were compared to original bitumen raw material-vacuum residue and vacuum residue oxidation products during short-term and long-term aging. The complex shear modulus of the vacuum residue and its oxidation products decreased with an increase in temperature. Short-term aging resulted in increased shear modulus for all samples.The vacuum residue oxidation product modified with crumb rubber had the maximum values of the rutting parameter and fatigue parameter. There was an expansion of the temperature range of plasticity: for the vacuum residue oxidation product with crumb rubber, its value was 67.2◦C. The curves of the black diagram of the modified vacuum residue oxidation product are shifted towards smaller phase angles with the increase in the shear modulus, which indicates the increase in the stiffness and elasticity of the rubber bitumen binders. The vacuum residue oxidation product modified with crumb rubber corresponded to the rubber bitumen binder of the grade RBB 60/90, according to its physical and mechanical indicators.	Ongarbayev Y., Zhambolova A., Tileuberdi Y., Mansurov Z., Rossi C.O., Calandra P., Teltayev B. Aging Process Effects on the Characteristics of Vacuum Residue Oxidation Products with the Addition of Crumb Rubber // Molecules, 2022. –Vol.27. -No10. – P.3284. DOI:10.3390/molecules27103284 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85130529035&doi=10.3390%2fmolecules27103284&partnerID=40&md5=4924b3a0fdc21cf57880c32fa390e09d

112.	Activated Carbon/Pectin Composite Enterosorbent for Human Protection from Intoxication with Xenobiotics Pb(II) and Sodium Diclofenac	DOI:10.3390/molecules27072296	The use of enterosorbents—materials which can be administered orally and eliminate toxic substances from the gastrointestinal tract (GIT) by sorption—offers an attractive complementary protection of humans against acute and chronic poisoning. In this study, we report the results of developing a microgranulated binary biomedical preparation for oral use. It was designed with a core-shell structure based on pectin with low degree of esterification as the core, and nanoporous activated carbon produced from rice husk, AC-RH, as the shell, designated as AC-RH@pectin. The adsorption properties of the synthesized materials were studied in aqueous solutions for the removal of lead (II) nitrate as a representative of toxic polyvalent metals and sodium diclofenac as an example of a medicinal drug. The composite enterosorbent demonstrated high adsorption capacity for both adsorbates studied. Adsorption kinetics of lead and diclofenac adsorption by AC-RH, pectin, and AC-RH@pectin, fitted well a pseudo-second-order model. According to the Langmuir adsorption isotherm model, the best fitted isotherm model, the maximum adsorption capacity, qmax, of AC-RH@pectin for diclofenac and for lead (II) was 130.9 mg/g and 227.8 mg/g, respectively. Although qmax of AC-RH for diclofenac, 537.6 mg/g, and qmax of pectin for lead (II), 245.7 mg/g, were higher, the maximum adsorption capacity of AC-RH for lead (II), 52.7 mg/g, was much lower than that of the composite AC-RH@pectin and the adsorption capacity of pectin for diclofenac was negligible. Therefore, the composite material AC-RH@pectin demonstrated substantial efficiency of removing both species which potentially defines it as a more universal enterosorbent suitable for treating poisoning caused by substances of different chemical nature.	Jandosov J., Alavijeh M., Sultakhan S., Baimenov A., Bernardo M., Sakipova Z., Azat S., Lyubchyk S., Zhylybayeva N., Naurzbayeva G., Mansurov Z., Mikhalovsky S., Berillo D. Activated Carbon/Pectin Composite Enterosorbent for Human Protection from Intoxication with Xenobiotics Pb(II) and Sodium Diclofenac // Molecules, 2022. –Vol.27. -No7. –P.2296. DOI:10.3390/molecules27072296 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85128097030&doi=10.3390%2fmolecules27072296&partnerID=40&md5=08165c8ecf184185c0e19af7733151a7
113.	Revisiting the carbon mesopore contribution towards improved performance of ionic liquid–based EDLCs at sub-zero temperatures	DOI:10.1007/s11581-021-04354-w	The important role of mesopores has been investigated in electric double-layer capacitors (EDLCs) operating from 24 °C down to − 40 °C by using two in-house synthesized carbons with hierarchical porosity. These carbons were prepared from colloidal nanoparticles of SiO2 as the template and d-glucose as the carbon source. A decrease in the average diameter of the nanoparticles from 12 to 8 nm results in increased surface area and offers a perfect match between	Pavlenko V., Kalybekkyzy S., Knez D., Abbas Q., Mansurov Z., Bakenov Z., Ng A. Revisiting the carbon mesopore contribution towards improved performance of ionic liquid–based EDLCs at sub-zero temperatures // Ionics,

			ions of binary mixture of imidazolium-based fluorinated ionic liquids and the pores of carbon. Short-range graphene layers produced with 8-nm silica nanoparticles lead to the creation of transport channels which better accommodate ions. We explain these findings per coulombic interactions among the ions and between the pore wall and the ionic species under confinement and electrochemical polarization conditions. Further, it is shown that a microporous carbon (another in-house produced rice-husk carbon SBET = 1800 m2·g−1) performs better than hierarchical carbons at room temperature	2022. –Vol.28. -No2. –P.893-901. DOI:10.1007/s11581-021-04354-w https://www.scopus.com/inward/record.uri?eid=2-s2.0-85118582487&doi=10.1007%2fs11581-021-04354-w&partnerID=40&md5=253262a5b284ed077aef0401d2b452d6
114.	Carbon/NiO Compositional Fibers	DOI:10.18321/ectj1319	This article presents the results of the synthesis of carbon-NiO composite fibers. Fibers doped with NiO particles are of practical interest for applications in sensors, energy storage systems, photocatalysts, etc. Four-component initial fibers based on polyacrylonitrile (PAN), activated carbon (AC), coal tar pitch (CTP), and NiO particles were obtained. CTP was obtained by thermal treatment of coal tar, AC by carbonization of apricot kernels, NiO by solution combustion synthesis. PAN, CTP, and AC are a source of carbon, but each of them plays a specific role. PAN is the basis of carbon fibers and a fiber-forming material, CTP is a technogenic waste added to replace polymer particles, AC is an additive that could increase the carbon content and the porosity of the final fibers. The fibers were obtained using the electrospinning method, which makes it possible to use complex suspensions and obtain fibers of various diameters. PAN:CTP:AC:NiO fibers were obtained. Next, the processes of stabilization and carbonization of the fibers were carried out. The fibers at each stage were examined by scanning electron microscopy and EDAX. The result of the synthesis was carbon/NiO fibers with a diameter of 100–300 nm. The resulting fibers are promising for practical applications due to the one-dimensional structure of the fibers and better adhesion between the fiber and NiO particles.	Mansurov Z.A., Smagulova G.T., Imash A.A., Taurbekov A.T., Elouadi B., Kaidar B.B. Carbon/NiO Compositional Fibers // Eurasian Chemico-Technological Journal, 2022. –Vol.24. –No2. –P.59-67. DOI:10.18321/ectj1319 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85138708000&doi=10.18321%2fectj1319&partnerID=40&md5=04220dddc37675febc94af33396990a8

115.	COMPARATIVE STUDY OF THE THERMAL DECOMPOSITION OF HYDROXYLAMMONIUM NITRATE GREEN ENERGETIC COMPOUND: COMBINATION BETWEEN EXPERIMENTAL AND DFT CALCULATION	DOI:10.1615/IntJEnergeticMaterialsChemProp.2022044056	Hydroxylammonium nitrate (HAN), as a tentative candidate to replace hydrazine, has been exten-sively studied by several research groups. Indeed, studies of its thermal decomposition in liquid state have been performed via online and real-time analysis. Advanced thermal analysis has been carried out using the direct insertion probe–mass spectrometry (DIP–MS) technique with higher tempera-ture ramp of 128°C min–1 . A pyrolizer was used to decompose the HAN solution at 280°C, and the detected gases were analyzed online. On the other hand, the theoretical aspects have completed the experimental data by using the differential function theory (DFT) to explain the thermal decomposition mechanism at the gas and liquid phases of HAN base, and to see the effect of water as a solvent on HAN reactivity and the energy diagrams.	Souagh A., Remissa I., Atamanov M., Alaoui H.E., Amrousse R. COMPARATIVE STUDY OF THE THERMAL DECOMPOSITION OF HYDROXYLAMMONIUM NITRATE GREEN ENERGETIC COMPOUND: COMBINATION BETWEEN EXPERIMENTAL AND DFT CALCULATION // International Journal of Energetic Materials and Chemical Propulsion, 2022. –Vol.21. -No5. –P.31-38. DOI:10.1615/IntJEnergeticMaterialsChemProp.2022044056 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85139123625&doi=10.1615%2fIntJEnergeticMaterialsChemProp.2022044056&partnerID=40&md5=a852001022a7fcc8497241a148f00eef
116.	THERMAL DECOMPOSITION BEHAVIORS OF 30% HYDROGEN PEROXIDE OVER FREE NOBLE METAL-SYNTHESIZED SOLID CATALYSTS	DOI:10.1615/IntJEnergeticMaterialsChemProp.2022043338	In this study, the thermal decomposition process of hydrogen peroxide (H2 O2) as a green energetic material was performed over free noble metal-synthesized catalysts. A mass percent of 30% H2 O2 liquid (w/w) was decomposed over 1 wt% of solid catalysts based on copper, cobalt, and chromium metals. In this research work, the catalytic performance of the H2 O2 thermal decomposition process was carried out by measuring the differential pressure versus the time at initial constant tempera-tures. In addition, for first time the differential thermal analysis/thermogravimetric technique was used at atmospheric pressure. The obtained preliminary results showed that copper-based catalysts are promising candidates for the decomposition of H2 O2 liquid solutions. Moreover, the scanning electron microscopy technique was used to characterize the solid surfaces in	Remissa I., Souagh A., Hairch Y., Sahib-Eddine A., Atamanov M., Amrousse R. THERMAL DECOMPOSITION BEHAVIORS OF 30% HYDROGEN PEROXIDE OVER FREE NOBLE METAL-SYNTHESIZED SOLID CATALYSTS // International Journal of Energetic Materials and Chemical Propulsion, 2022. –Vol.21. -No5. –P.17-29. DOI:10.1615/IntJEnergeticMaterialsChemProp.2022043338 https://www.scopus.com/inward/record.uri?eid=2-s2.0-

			order to understand the morphological characteristics of the solids.	85139088279&doi=10.1615%2fIntJEnergeticMaterialsChemProp.2022043338&partnerID=40&md5=74045dd9d9c0932731af8acd49e8ced1
117.	Optimization of Aluminum Boride Synthesis in the Self-Propagating High-Temperature Synthesis Mode to Create Waste-Free Technology	DOI:10.3390/ceramics5040091	This paper is the continuation of our previous paper. In this work, we optimized the synthesis of aluminum borides by the SHS method. The purpose of the research was to develop the foundations of waste-free technology. The initial components were powders of boric anhydride (B2O3), aluminum (Al), the oxide-heating additive (KNO3), various fluxing additives, including mixed ones. The optimal ratios of the initial components for increasing the yield of aluminum boride with a high boron content and obtaining slag suitable for the production of high-alumina clinkers were determined. Studies have shown that the development of a waste-free technology for producing aluminum borides by the method of self-propagating high-temperature synthesis (SHS) is possible and yields target (alloy) and by-product (slag) products that meet the requirements for chemical and phase composition.	Aknazarov S.K., Mutushev A.Z., Gonzalez-Leal J.M., Bairakova O.S., Golovchenko O.Y., Golovchenko N.Y., Ponomareva E.A. Optimization of Aluminum Boride Synthesis in the Self-Propagating High-Temperature Synthesis Mode to Create Waste-Free Technology Ceramics, 2022. – Vol.5. –No.4. –P.1286-1299. DOI:10.3390/ceramics5040091 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85144678491&doi=10.3390%2fceramics5040091&partnerID=40&md5=d3285f688b5e494a4bff749ff9ed7350
118.	Kinetics of the Synthesis of Aluminum Boride by the Self-Propagating High-Temperature Synthesis Method	DOI:10.3390/ceramics5030033	The influence of certain factors on the kinetics of the process of obtaining aluminum borides (burning rate, ingot formation, and phase separation) was investigated. In this study, we report the registration of diboride using the SHS protocol. The synthesis of aluminum diboride from boric anhydride occurred by the aluminothermic method. The initial components were boron trioxide and aluminum in the form of powders. Researchers paid special attention to the degree of grinding of the charge fluxing substances. The influence this had on the rate of development of the degree of charge concentration was studied. To calculate the degree of charge, a composition was chosen according to the speed obtained from a number of experiments where melting was carried out with the following charge densities in g/cm3: 0.80	Aknazarov S.K., Mutushev A.Z., Gonzalez-Leal J.M., Bairakova O.S., Golovchenko O.Y., Golovchenko N.Y., Ponomareva E.A. Kinetics of the Synthesis of Aluminum Boride by the Self-Propagating High-Temperature Synthesis Method // Ceramics, 2022. – Vol.5. -No3. –P.435-446. DOI:10.3390/ceramics5030033 https://www.scopus.com/inward/record.uri?eid=2-s2.0-

				85138699092&doi=10.3390%2fceramics5030033&partnerID=40&md5=14fa4d0dc064d5584993e614bd9911e7
119.	Determination of Thermodynamic Characteristics of Phase-stabilized Ammonium Nitrate-Based High-energy Solid Combustible Materials	DOI:10.1080/00102202.2020.1786076	The thermodynamic and physical characteristics of the starting components and the synthesized high-energy solid combustible materials are determined. It was established that the reaction of the formation of aluminum nitride in the endothermic mode is possible at a temperature of about 3000 K. The adiabatic combustion temperatures of the synthesized fuel systems in the combustion chamber are calculated. The dependence of the values of the adiabatic temperature and specific impulse on the excess of the oxidizing agent, the nature of the binder and energy additives is established.	Aknazarov S.K., Seisenova A.B., Golovchenko O.Y., Golovchenko N.Y., Gonzalez-Leal J.M. Determination of Thermodynamic Characteristics of Phase-stabilized Ammonium Nitrate-Based High-energy Solid Combustible Materials // Combustion Science and Technology, 2022. –Vol.194. - No4. –P.768-784. DOI:10.1080/00102202.2020.1786076 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85087656158&doi=10.1080%2f00102202.2020.1786076&partnerID=40&md5=aea5d082051af09dbc71663144acfdb6
120.	A mini-review on recent trends in prospective use of porous 1D nanomaterials for hydrogen storage	DOI:10.1016/j.sajce.2021.11.008	The sustainable development of hydrogen energy is a priority task for a possible solution to the global energy crisis. Hydrogen is a clean and renewable energy source that today is used exclusively in the form of compressed gas or in liquefied form, which prevents its widespread use. Storing hydrogen in solid-state systems will not only increase the bulk density and gravimetric capacity, but will also have a positive impact on safety issues. From this point of view, the current review considers the latest research in the field of application of 1D nanomaterials for solid-state hydrogen storage, and also discusses the mechanisms of its adsorption and desorption. Despite the high publication activity, the use of 1D nanomaterials for hydrogen storage has not been fully studied. In the current review, modern developments in the	Daulbayev C., Lesbayev B., Bakbolat B., Kaidar B., Sultanov F., Yeleuov M., Ustayeva G., Rakhymzhan N. A mini-review on recent trends in prospective use of porous 1D nanomaterials for hydrogen storage // South African Journal of Chemical Engineering, 2022. –Vol.39. - No52. –P.61. DOI:10.1016/j.sajce.2021.11.008

			field of hydrogen storage using 1D nanomaterials and composites based on them are investigated in detail, and their problems and future prospects are discussed.	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85119358501&doi=10.1016%2fj.sajce.2021.11.008&partnerID=40&md5=115bfc6656772809695dcd23e5fd88b6
121.	Biomass-Derived Porous Carbon Materials for Li-Ion Battery // Nanomaterials	DOI:10.3390/nano12203710	Biomass-based carbon nanofibers (CNF) were synthesized using lignin extracted from sawdust and polyacrylonitrile (PAN) (30:70) with the help of the electrospinning method and subsequent stabilization at 220 °C and carbonization at 800, 900, and 1000 °C. The synthesized CNFs were studied by scanning electron microscopy, energy-dispersive X-ray analysis, Raman spectroscopy, and the Brunauer–Emmett–Teller method. The temperature effect shows that CNF carbonized at 800 °C has excellent stability at different current densities and high capacitance. CNF 800 in the first test cycle at a current density of 100 mA/g shows an initial capacity of 798 mAh/g and an initial coulomb efficiency of 69.5%. The CNF 900 and 1000 show an initial capacity of 668 mAh/g and 594 mAh/g, and an initial Coulomb efficiency of 52% and 51%. With a long cycle (for 500 cycles), all three samples at a current density of 500 mA/g show stable cycling in different capacities (CNF 800 in the region of 300–400 mAh/g, CNF 900 and 1000 in the region of 100–200 mAh/g).	Nazhipkyzy M., Maltay A.B., Askaruly K., Assylkhanova D.D., Seitkazinova A.R., Mansurov Z.A. Biomass-Derived Porous Carbon Materials for Li-Ion Battery // Nanomaterials, 2022. –Vol.12. -No20. –P.3710. DOI:10.3390/nano12203710 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85140899636&doi=10.3390%2fnano12203710&partnerID=40&md5=263761749af64ddad17bfa36d39fa296
122.	Advances of Biowaste-Derived Porous Carbon and Carbon–Manganese Dioxide Composite in Supercapacitors: A Review	DOI:10.3390/inorganics10100160	One of the global problems is environmental pollution by different biowaste. To solve the problem, biowaste must be recycled. Waste-free technology is also a way of saving exhaustible raw materials. Research on electrochemical energy sources is currently the most dynamically developing area of off-grid energy. Electrochemical capacitors can operate for a long time without changing performance, they have smaller dimensions, high mechanical strength, and a wide operating temperature range. These properties are effective energy-saving devices. Therefore, supercapacitors are widely used in various industries. This review discussed the methods of obtaining and the characteristics of biowaste-derived activated carbon and carbon–manganese oxide (AC-MnO2)-based supercapacitor electrodes.	Zekenova A., Nazhipkyzy M., Li W., Kalybayeva A., Zhumanova G., Zubova O. Advances of Biowaste-Derived Porous Carbon and Carbon–Manganese Dioxide Composite in Supercapacitors: A Review // Inorganics, 2022. –Vol.10. -No10. –P.160. DOI:10.3390/inorganics10100160 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85140588759&doi=10.3390%2

				finorganics10100160&partnerID=40&md5=6cd0a81b0d201582b656270ee9b2a5b5
123.	Electrochemical Performance of Chemically Activated Carbons from Sawdust as Supercapacitor Electrodes	DOI:10.3390/nano12193391	Activated carbons (ACs) have been the most widespread carbon materials used in supercapacitors (SCs) due to their easy processing methods, good electrical conductivity, and abundant porosity. For the manufacture of electrodes, the obtained activated carbon based on sawdust (karagash and pine) was mixed with conductive carbon and polyvinylidene fluoride as a binder, in ratios of 75% activated carbon, 10% conductive carbon black, and 15% polyvinylidene fluoride (PVDF) in an N-methyl pyrrolidinone solution, to form a slurry and applied to a titanium foil. The total mass of each electrode was limited to vary from 2.0 to 4.0 mg. After that, the electrodes fitted with the separator and electrolyte solution were symmetrically assembled into sandwich-type cell construction. The carbon's electrochemical properties were evaluated using cyclic voltammetry (CV) and galvanostatic charge–discharge (CGD) studies in a two-electrode cell in 6M KOH. The CV and CGD measurements were realized at different scan rates (5–160 mV s−1) and current densities (0.1–2.0 A g−1) in the potential window of 1 V. ACs from KOH activation showed a high specific capacitance of 202 F g−1 for karagash sawdust and 161 F g−1 for pine sawdust at low mass loading of 1.15 mg cm−2 and scan rate of 5 mV s−1 in cyclic voltammetry test and 193 and 159 F g−1 at a gravimetric current density of 0.1 A g−1 in the galvanostatic charge–discharge test. The specific discharge capacitance is 177 and 131 F g−1 at a current density of 2 A g−1. Even at a relatively high scan rate of 160 mV s−1, a decent specific capacitance of 147 F g−1 and 114 F g−1 was obtained, leading to high energy densities of 26.0 and 22.1 W h kg−1 based on averaged electrode mass. Surface properties and the porous structure of the ACs were studied by scanning electron microscopy, energy-dispersive X-ray analysis, Raman spectroscopy, and the Brunauer–Emmett–Teller method.	Nazhipkyzy M., Yeleuov M., Sultakhan S.T., Maltay A.B., Zhaparova A.A., Assylkhanova D.D., Nemkayeva R.R. Electrochemical Performance of Chemically Activated Carbons from Sawdust as Supercapacitor Electrodes // Nanomaterials, 2022. –Vol.12. -No19. –P. 3391. DOI:10.3390/nano12193391 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85139820527&doi=10.3390%2fnano12193391&partnerID=40&md5=8222a1f3d6f2b88bbc023f230cc37592

124.	Effective separation of petroleum oil-water mixtures via flexible and re-usable hydrophobic soot-coated melamine sponge	DOI:10.1016/j.jwpe.2022.103032	Superhydrophobic materials like carbon-coated sponges have been attracting attention due to their wide applicability in several industries. One of the main applications of such materials is the efficient removal of various water pollutants such as oil by adsorption. Herein, a flexible, porous, and hydrophilic melamine sponge was coated by superhydrophobic soot that was produced by incomplete combustion of the propane-butane mixture. Characterization of the soot and the sponge was performed via several methods such as spectroscopy, microscopy, and thermogravimetry. The product was tested in the petroleum oil removal process. The superhydrophobic sponge repelled water well and at the same time perfectly sorbed oil products. The wetting edge angle of soot coated sponge was found between 145 and 150°. The sponge showed an excellent adsorption capacity of 24 g oil/g for the selective separation of oil from water. The entrapped oil was released simply by squeezing the sponge for cyclic use and about 95.5 wt% of the oil was adsorbed and the soot-coated sponge still maintained this capacity after 19 cycles. Hence, this novel soot-coated hydrophobic sponge is considered a promising candidate for oil-polluted water treatment.	Nazhipkyzy M., Assylkhanova D., Araylim N., Seitkazinova A., Özsin G., Varol E.A. Effective separation of petroleum oil-water mixtures via flexible and re-usable hydrophobic soot-coated melamine sponge // Journal of Water Process Engineering, 2022. –Vol.49. -No103032 DOI:10.1016/j.jwpe.2022.103032 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85135343517&doi=10.1016%2fj.jwpe.2022.103032&partnerID=40&md5=52ba9cc01fa9946e0b1c03c0882fda6d
125.	The Use of Diatomite as a Catalyst Carrier for the Synthesis of Carbon Nanotubes	DOI:10.3390/nano12111817	In this article, multiwalled carbon nanotubes (MWCNTs) have been synthesized on the surface of a diatomite mineral impregnated with transition metal salts using a propane-butane mixture in a chemical vapor deposition reactor at atmospheric pressure. The catalyst concentration and synthesis temperature have been varied in order to understand their effects on the formation of MWCNTs and their morphology. Diatomite was chosen as a catalyst carrier due to its elemental composition. It is mainly composed of amorphous silica, quartz and also contains such metals as Fe, K, Ca, Mn, Cr, Ti, and Zn, which makes it a promising material for use as a catalyst carrier when synthesizing carbon nanotubes (CNTs) by catalytic chemical vapor deposition (C-CVD). For the synthesis of carbon nanotubes by C-CVD on the surface of the diatomite, the following salts were used as a catalyst: CoCl2·6H2 O	Nazhipkyzy M., Nemkayeva R.R., Nurgain A., Seitkazinova A.R., Dinistanova B.K., Issanbekova A.T., Zhylybayeva N., Bergeneva N.S., Mamatova G.U. The Use of Diatomite as a Catalyst Carrier for the Synthesis of Carbon Nanotubes // Nanomaterials, 2022. –Vol.12. -No11. –P.1817. DOI:10.3390/nano12111817 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85130818142&doi=10.3390%2fnano12111817&partnerID=40

				&md5=12684658ee6975000fa79d0b660d7263
126.	Carbon Nanotubes Synthesized by CCVD Method using Diatomite and Shungite Minerals		In this work, carbon nanotubes were prepared using catalysts consisting of nickel particles supported on the naturally occurring minerals diatomite and shungite. The carbon source for the chemical catalytic vapour deposition (CCVD) synthesis was a propane-butane gas mixture. The synthesized multiwall carbon nanotubes (MWCNT) were characterized using Raman spectroscopy, transmission and scanning electron microscopy, and the effect of temperature on their structure was investigated. The carbon content was determined by thermogravimetric analysis. In Raman spectra of CNTs the intensity ratio I(G)/I(D) for 650 °C is higher than that for 700 °C and then it begins to increase with increasing temperature. The results show that the diameter of CNTs which were synthesized on the surface of diatomite/shungite samples were in the range of 33–100.3 nm. The development of new methods for creating catalytic systems that allow controlling the structure of carbon particles is an important task leading to the improvement of existing approaches to the synthesis of CNTs with certain functional properties.	Nazhipkyzy M., Harris P.J.F., Nurgain A., Nemkayeva R.R. Carbon Nanotubes Synthesized by CCVD Method using Diatomite and Shungite Minerals // Eurasian Chemico-Technological Journal, 2022. –Vol.24. –No.1. –P.3-11. DOI:10.18321/ectj1143 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85132298332&doi=10.18321%2fectj1143&partnerID=40&md5=19326980c6891aa19ff0a2bf0f4d98c
127.	Use of Vegetable Raw Materials as Electrode Materials for Li-Ion Batteries	DOI:10.3303/CET2295042	Kazakhstan possesses a large scale of cereal crops, bulrush, seeded fruits, grasslands and forests which are significant renewable resources for carbon materials. The agricultural sector, upon processing seeded fruits (e.g. apricots), rice, and others, produces large amounts of high carbon content wastes. It is known that obtaining carbon from these biomasses (wastes) is a cheap way of their utilization/disposal. There are existing technologies to produce so-called activated (porous) carbons mainly using thermolysis. Biomass waste could be considered as a potential material source for the preparation of porous carbons, which may have enhanced electrochemical capacitive performance in capacitors and cycling efficiency in lithium-ion batteries (LIBs). Biomass derived activated carbon (AC) is a promising solid carrier due to its high adsorption capacity specific surface area, hierarchical porous structure, and can exhibit excellent electrical conductivity. The main aim	Nazhipkyzy M., Assylkhanova D., Maltay A., Dinistanova B., Tureshova G., Issanbekova A., Kudyarova Z. Use of Vegetable Raw Materials as Electrode Materials for Li-Ion Batteries // Chemical Engineering Transactions, 2022. –No.95. –P.247-252. DOI:10.3303/CET2295042 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85144059114&doi=10.3303%2fCET2295042&partnerID=40&md5=e029102854bffb0bf568f03192271c48

			of this study was to research the influence of the properties of different vegetable raw materials, such as apricot stone (AS), rice husk (RH), walnut shell (WSh) on their electrochemical properties. The results of the electrochemical investigations showed good cyclic reversibility and stability. The battery with carbon electrode from walnut shells performed the highest capacity of 1000 mAhg-1 over 150 cycles.	
128.	MODIFIED ZEOLITE CATALYSTS FOR EFFICIENT PROCESSING OF N-HEXANE AND GASOLINE FRACTION	DOI:10.31788/RJC.2022.1548077	In this work hydrogen-free processing (in the absence of hydrogen) and hydrotreating of n-hexane and straight-run petrol fraction on the catalysts samples “C-1” (La-ZSM-Al2O3) and “C-2” (Ni-Mo-La-P-ZSM-Al2O3) were studied. “C-2” catalyst has high activity in both studied processes. The conversion of n-hexane during hydrogen-free processing on the “C-2” catalyst in the range of 350-500ºC increased from 58.8 to 90.7%	Tuktin B.T., Omarova A.A., Sassykova L.R., Saidilda G.T., Khamlenko A.A., Sendilvelan S., Tulepov M.I. MODIFIED ZEOLITE CATALYSTS FOR EFFICIENT PROCESSING OF N-HEXANE AND GASOLINE FRACTION // Rasayan Journal of Chemistry, 2022. –Vol.15. -No4. –P.2442-2449. DOI:10.31788/RJC.2022.1548077 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85145389798&doi=10.31788%2fRJC.2022.1548077&partnerID=40&md5=7748 1dc4e7074661c0966dc13962b450
129.	Conversion of Light Hydrocarbons on Modified Zeolite Catalysts	DOI:10.1134/S0040579522310037	The physicochemical properties of zeolite-containing catalysts modified via introduction of zinc, manganese, lanthanum, and phosphorus, as well as their activity in the aromatization of propane–butane and propane–propylene fractions, are studied with temperature-programmed desorption of ammonia, transmission electron microscopy, and BET. The maximum amount of aromatic hydrocarbons (40.3%) is formed during the processing of the propane–butane fraction on a Zn–La–Mn–ZSM–Al2O3 catalyst at 600°C, whereas the selectivity for aromatic hydrocarbons is 51.3%. When the propane–propylene fraction is processed within 400–600°C, the yield of aromatic hydrocarbons on the Zn–La–Mn–ZSM–Al2O3 catalyst is significantly higher in	Temirova A.M., Tuktin B.T., Omarova A.A., Aubakirov E.A., Anisimov A.V. Conversion of Light Hydrocarbons on Modified Zeolite Catalysts // Theoretical Foundations of Chemical Engineering, 2022. –Vol.56. -No5. –P.892-899. DOI:10.1134/S0040579522310037https://www.scopus.com/inward/record.uri?eid=2-s2.0-85141914959&doi=10.1134%2fS0040579522310037&partner

			comparison with any of the other catalysts studied. The activity of the catalysts in the processing of light hydrocarbons depends on the structure and the state of the active sites.	ID=40&md5=27e06b5ba4ea5db4917cb2562491d73c
130.	Effective removal of methylene blue dye by a novel 4-vinylpyridine-co-methacrylic acid cryogel: kinetic, isotherm, and breakthrough studies	DOI:10.1002/jctb.7197	BACKGROUND: Industrial streams are the source of increasing amounts of textile dye pollution every year. Among the various adsorbents that have been tested for the removal of dyes, synthetic macroporous polymers are a promising choice due to their developed structure, the presence of active functional groups, and the possibility of regeneration and reuse for several cycles. In this work, a 4-vinylpyridine-co-methacrylic acid based cryogel (4-VP-MAAc) was synthesized at -12 °C by the free-radical polymerization technique, it was characterized using a set of complimentary methods, and then applied for the removal of methylene blue (MB) from water solutions. RESULTS: The adsorption of MB was enhanced at pH values higher than 7 due to the presence of anionic functional groups. The maximum equilibrium adsorption capacity achieved by 4-VP-MAAc was 703.6 mg/g at pH 8. Several kinetics, equilibrium, pH studies, and fixed-bed column experiments were completed in ultra-pure water to evaluate the performance and the mechanism of interaction of positively-charged dye with the polymer. Among the kinetic models applied, the pseudo-second order model best fit the experimental observations. The Langmuir model efficiently described the adsorption of MB onto the prepared cryogel, thus indicating monolayer adsorption. The ion exchange of the Na+ ions present in the structure of the cryogel with dye was found to be the main removal mechanism accompanied with a complexation reaction. No loss of adsorption capacity was observed in four successive adsorption/desorption cycles of 4-VP-MAAc use. CONCLUSION: This is the first time that a 4-vinylpyridine-co-methacrylic acid based cryogel has been synthesized and successfully applied to remove MB from water. © 2022 Society of Chemical Industry (SCI).	Megbenu H.K., Tauanov Z., Daulbayev C., Poulopoulos S.G., Baimenov A. Effective removal of methylene blue dye by a novel 4-vinylpyridine-co-methacrylic acid cryogel: kinetic, isotherm, and breakthrough studies // Journal of Chemical Technology and Biotechnology, 2022. –Vol.97. -No12. –P.3375-3384. DOI:10.1002/jctb.7197 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85135796760&doi=10.1002%2fjctb.7197&partnerID=40&md5=e4897ae6a431e002924627f5aa7f6905

131.	Iodide Removal by Resorcinol-Formaldehyde Carbon Aerogels	DOI:10.3390/ma15196885	The adsorption technique is widely used in water purification, and its efficiency can be significantly improved by target-specific adsorbent design. Research on iodine and its ion removal from water has attracted a great deal of interest due to increased concentrations in the environment and acute toxic effects, e.g., in human thyroid cells. In this work, the iodide removal performance of two high-surface-area resorcinol–formaldehyde-based carbon aerogels was studied under acidic conditions. The BET surface area was 790 m2/g (RF_ac) and 375 m2/g (RMF-GO), with a corresponding micropore ratio of 36 and 26%, respectively. Both aerogels showed outstanding adsorption capacity, exceeding the reported performance of other carbons and Ag-doped materials. Owing to its basic nature, the RMF-GO carbon aerogel showed higher I− capacity, up to 97 mg/g, than the acidic RF_ac, which reached a capacity of 82 mg/g. The surface chemistry of the aerogels also played a distinct role in the removal. In terms of kinetics, RF_ac removed 60% of the iodide ions and RMF-GO 30% within 8 h. The removal kinetics was of the first order, with a half-life of 1.94 and 1.70 h, respectively.	Domán A., Battalgazy B., Dobos G., Kiss G., Tauanov Z., László K., Zorpas A.A., Inglezakis V.J. Iodide Removal by Resorcinol-Formaldehyde Carbon Aerogels // Materials, 2022. –Vol.15. -No19. –P. 6885. DOI:10.3390/ma15196885 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85139970160&doi=10.3390%2fma15196885&partnerID=40&md5=5ca50ad523b6730446d4f2903690884a
132.	Review on coal fly ash generation and utilization for resolving mercury contamination issues in Central Asia: Kazakhstan	DOI:10.1139/er-2021-0035	The generation of coal fly ash (CFA) in coal-fired power plants worldwide has been a major concern over the past few decades. CFA as a by-product possesses unique properties and chemical composition that could be utilized in resolving mercury contamination issues in Central Asia, particularly in Kazakhstan. This review gives an overview of coal generation capacity and evaluation of the current state of electricity production and ecological concerns related to CFA accumulation. We provide a detailed comparison of the physical properties and chemical compositions of three types of CFAs from Kazakhstani power plants, and present potential approaches to help alleviate mercury contamination issues. Furthermore, this review highlights the current state of mercury contamination in artificial Lake Balkyldak and in the Nura River of the north and central regions of Kazakhstan. Of particular interest is the appropriate utilization of CFAs in resolving mercury contamination issues by highlighting and	Satayeva A., Baimenov A., Azat S., Zhantikeyev U., Seisenova A., Tauanov Z. Review on coal fly ash generation and utilization for resolving mercury contamination issues in Central Asia: Kazakhstan // Environmental Reviews, 2022. –Vol.30. -No3. –P.418-437. DOI:10.1139/er-2021-0035 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85138480872&doi=10.1139%2fer-2021-0035&partnerID=40&md5=c8225a8ba7ab382d6777fddb5b646bc4

			comparing the state-of-the-art technology of porous and nonporous materials currently reported in the literature.	
133.	PrGO decorated TiO2 nanoplates hybrid nanocomposite for augmented NO2 gas detection with faster gas kinetics under UV light irradiation	DOI:10.1016/j.snb.2022.131503	Controlling the anatase TiO2 based-rectangular nanoplates (NPs) with {001} faces have gained immense interest in gas sensors applications, since the rectangular NPs of {001} planes are highly reactive for the adsorption of oxygen species that led to significant improvement in gas sensing performance. In this work, we report on the room temperature (RT) NO2 gas sensing performances of hybrid nanocomposites with the interpenetrated network using p-Phenylenediamine-reduced graphene oxide (PrGO) decorated TiO2 NPs. The fabricated TiO2 NPs/PrGO heterostructure sensor demonstrated the superior NO2 response (~14.9% to 100 ppm of NO2) compared to TiO2/rGO and pristine TiO2 nanoplates. On the other hand, the TiO2 NPs/PrGO heterostructure device showed high sensitivity, repeatability and excellent selectivity with short response/recovery times towards NO2 gas at RT. Further, the performances of the TiO2NPs/PrGO gas sensor was accelerated by UV irradiation (λ = 365 nm), and the response was found as ~35.68% to 100 ppm of NO2 at RT, which was ~2.35-fold times higher than the dark condition. The high gas sensing performance would be attributed to the electrical sensitization of PrGO and the ample interface between TiO2 NPs and PrGO that stimulated the charge separation with faster charge transport characteristics. Our strategy and results shed new light to exploit diverse functionalized materials to the high response gas sensors at RT.	Harathi N., Bollu M., Pasupuleti K.S., Tauanov Z., Peta K.R., Kim M.-D., Reddeppa M., Sarkar A., Rao V.N. PrGO decorated TiO2 nanoplates hybrid nanocomposite for augmented NO2 gas detection with faster gas kinetics under UV light irradiation // Sensors and Actuators B: Chemical, 2022. – Vol.358. -No131503 DOI:10.1016/j.snb.2022.131503 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85124216284&doi=10.1016%2fj.snb.2022.131503&partnerID=40&md5=f35147183efdfce3ae8455603bd55346
134.	Antimicrobial Properties of the Triclosan-Loaded Polymeric Composite Based on Unsaturated Polyester Resin: Synthesis, Characterization and Activity	DOI:10.3390/polym14040676	The manufacturing of sanitary and household furniture on a large scale with inherently antimicrobial properties is an essential field of research. This work focuses on the synthesis of polymer composites based on the unsaturated polyester of resin loaded with 5 wt.%-Triclosan produced by a co-mixing approach on automated technological complex with a potential for broad applications. According to findings, the polymer composite has a non-porous structure.	Tauanov Z., Zakiruly O., Baimenova Z., Baimenov A., Akimbekov N.S., Berillo D. Antimicrobial Properties of the Triclosan-Loaded Polymeric Composite Based on Unsaturated Polyester Resin: Synthesis, Characterization and Activity // Polymers, 2022.

				–Vol.14. -No4. –P.676. DOI:10.3390/polym14040676 https://www.scopus.com/inward/record.uri?eid=2-s2.0-85124697326&doi=10.3390%2fpolym14040676&partnerID=40&md5=af00a163a0fc088b04640e309ed7a448
135.	Production of coke from fractions of coke-chemical tar	DOI: 10.52351/00232815_2022_11_23	Разработан способ получения кокса из дистиллятных фракций каменноугольной смолы. Исследовано влияние технологических параметров процесса термообработки дистиллятных фракций смолы на выход кокса.	Смагулова Н.Т., Каирбеков Ж.К., Жанбырбаева Л.Д., Акан А. // Coke and Chemistry. – 2023
136.	Studying the Formation of Choline Chloride- and Glucose-Based Natural Deep Eutectic Solvent at the Molecular Level	https://doi.org/10.1007/s00894-022-05220-w	The liquid waste is the major source of waste, which usually generated from academic laboratories and industry during the extraction, separation, chemical synthesis, and pretreatment processes. These chemical and engineering processes require more solvents. In this regard, there is a need to develop more environmentally friendly, cheaper, non-toxic solvents that are harmless to humans and the environment. In this regard, deep eutectic solvents (DES) and their derivatives so-called natural deep eutectic solvents (NADES) are a new field in the search for green alternative solvents. In our work, the formation of choline chloride-based NADESs using density functional theory (DFT) calculations, and classical all-atom molecular dynamics (MD) simulation was studied in detail using Gaussian09 and Gromacs software's. Next, the ground state geometry optimizations were performed in the gas phase using DFT B3LYP 6–31 + G(d) level of theory. Moreover, classical all-atom MD simulations were implemented using Gromos force field. After the modeling and simulations, the DFT calculation results revealed the formation of NADESs via formation (creation) of binding between chlorine and choline, and chlorine and glucose. At the same time, the results of classical all-atom MD simulations, based on the time average of the equilibrated production run of MD simulations, stated that the nitrogen atom of choline ion and chloride ion has greater	Sailau Zh., Almas N., Aldongarov A., Toshtay K. Studying the Formation of Choline Chloride- and Glucose-Based Natural Deep Eutectic Solvent at the Molecular Level // *Journal of molecular modelling*. – 2022. – 28 (8). –P.1-8. https://doi.org/10.1007/s00894-022-05220-w

			interactions, while chloride ion has also greater interaction with glucose during formation of NADES. The outcomes of both DFT and classical all-atom MD simulations are in good agreements.	
137.	Preliminary Study and Assessment of Drinking Water from Almaty, Kazakhstan	https://doi.org/10.18321/ectj1478	Drinking water samples from eight districts of Almaty, Kazakhstan was collected and physical and chemical analysis of the samples was carried out. Quality indicators of drinking water, such as organoleptic characteristics of water (smell, taste, color, and turbidity), general characteristics (pH, total hardness, permanganate demand, and dry residue), inorganic substances (cations and anions) and contaminants (heavy metals and total petroleum hydrocarbons) were determined, except pesticide residues which will be analyzed for further analysis with a wide range of pollutants. According to all indicators obtained for all districts of Almaty, the anthropogenic impact on drinking water in Almaty districts is assessed as low, not exceeding the permissible maximum allowable concentrations (MAC) values, and drinking water in Almaty corresponds to the approved standards and rules for drinking water of Kazakhstan. Despite of the fact that studied pollutants are below their MAC values, they still pose threat to public health due to their accumulative properties. The study of drinking water in the districts of Almaty made it possible to assess the ecological state in the studied districts of Almaty, as well as to propose recommendations for improving the quality of drinking water in areas where water quality indicators are closer to their MAC values.	Sailaukhanuly Y., Popova A., Mansur T., Bexeitova K., Azat S., Toshtay K., Tasmagambetova A. Preliminary Study and Assessment of Drinking Water from Almaty, Kazakhstan //*Eurasian Chemico-Technological Journal*. – 2022. – Vol. 24. – №. 4. – P. 341–350-341–350. https://doi.org/10.18321/ectj1478
138.	Synthesis of vanadium-containing catalytically active phases for exhaust gas neutralizers of motor vehicles and industrial enterprises	https://doi.org/10.3390/catal12080842	The catalytically active vanadium-containing system of γ-Al_2O_3 was studied using a wide range of physical and chemical methods, depending on the synthesis conditions. It is shown that the vanadium-containing system includes several complexes with different thermal stabilities and catalytic activities. Low-active complexes are destroyed with the formation of more active ones based on V_2O_5 oxide, as the temperature of heat treatment increases. It can be assumed that V_2O_5 oxide has the decisive role in its catalytic activity. It was concluded that the vanadium-containing catalytic system on aluminium oxide, in the studied	Synthesis of vanadium-containing catalytically active phases for exhaust gas neutralizers of motor vehicles and industrial enterprises

			temperature range, is thermally stable and shows high activity not only in the reduction of nitrogen oxides but also in the oxidation of hydrocarbons (even of the most difficult ones, such as oxidizable methane). These properties of the system make it quite promising in the field of application for the purification of the exhaust gases of motor transport and industrial enterprises with environmentally harmful components, as well as for understanding the mechanism of the action of the catalysts in these processes, which is very important for solving the problems of decarbonization and achieving carbon neutrality.	
139.	Research of the Thermal Effect on the Fe-Cr-Al Alloy Foil in the Initial State and with the Supported Secondary Carrier	https://doi.org/10.3390/coatings12091266	Iron and chromium based alloys have found wide application in various fields of science and technology. A primary carrier based on Fe-Cr-Al alloy is used in block catalysts for high temperature hydrocarbon conversion, in production of block metal catalysts for neutralization of toxic gases released during operation of internal combustion engines, as well as those present in smoke emissions from enterprises. The influence of thermal action on Fe-Cr-Al alloy foil and stability of the secondary carrier on its surface was studied. The elemental composition of the surface layer of Fe-Cr-Al alloy foil does not remain constant during heating and depends on the thermal treatment mode. Some of the elements come to surface and the elemental composition of the surface layer can differ significantly from that observed in the bulk of the foil sample. This implies the possibility of changing the adhesive and adsorption properties of the foil surface, as well as the need to take this fact into account when supporting a secondary carrier and active phase to the foil. An applied technique of phosphating and supporting a secondary carrier at the foil surface makes it possible to obtain a sufficiently stable coating. There is no shedding of the secondary carrier from the foil surface during high-temperature treatment in air.	Research of the Thermal Effect on the Fe-Cr-Al Alloy Foil in the Initial State and with the Supported Secondary Carrier
140.	Catalytic Reforming of Biogas to Produce Environmentally Friendly High Effective Fuels	DOI:10.3303/CET2294164	In today's world, environmental issues are becoming more and more relevant. In connection with the growing industrial activity of mankind, a large amount of CH_4 and CO_2 is emitted into the atmosphere. Since the start of the Industrial Revolution, CO_2 concentrations have increased by more than	Catalytic Reforming of Biogas to Produce Environmentally Friendly High Effective Fuels

			45 %, from 280 ppm in the mid-18th century to 415 ppm in 2019. Biogas mainly consists of 50-87 % methane, 13-50 % carbon dioxide and other gases. Conversion of biogas solves two important issues related to the utilization of greenhouse gases and the possibility of obtaining synthesis-gas with an optimal ratio of 1 : 1. Carrying out the Fischer-Tropsch synthesis reaction, the production of gasoline, jet fuel, ethanol and other oxygen-containing compounds is possible at this ratio. Development of new applied catalysts, as well as optimal technological conditions for synthesis-gas production in the process of catalytic conversion of biogas, is a contribution to the petrochemical sector, namely gas processing. Optimal conditions for the oxidative conversion of a model mixture of biogas into synthesis-gas on Ni-, Co-monometallic and Ni-Co bimetallic catalysts at different ratios to obtain maximum yield of products with rational consumption of raw materials and energy were determined: T = 700 °C, GHSV = 6,000 h^{-1}, CH_4 : CO_2 : Ar = 1 : 1 : 1 ratio in the reaction mixture.	
141.	Ni-Al Self-Propagating High-Temperature Synthesis Catalysts in Dry Reforming of Methane to Hydrogen-Enriched Fuel Mixtures	https://doi.org/10.3390/catal12101270	The worldwide increase in demand for environmentally friendly energy has led to the intensification of work on the synthesis of H2-containing fuel. The dry reforming of methane has become one of the most important avenues of research since the consumption of two greenhouse gases reduces the rate of global warming. A study of NiAl composite materiaлls as catalysts for methane reforming has been carried out. Self-propagating high-temperature synthesis (SHS) has been used to produce NiAl catalysts. Comparative studies were carried out regarding the dry reforming and partial oxidation of methane, as well as catalysts prepared using the impregnation (IM) and SHS methods. A catalyst with 29% Ni and 51% Al after SHS contains the phases of NiAl and NiAl2O4, which are active phases in the dry reforming of methane. The optimal crystal lattice parameter (for the maximum possible conversion of CO2 and CH4) is 3.48–3.485 Å for Al2O3, which plays the role of a catalyst carrier, and 1.42 Å, for NiAl2O4, which plays the role of a catalyst. The aim of the work is to develop a new and efficient catalyst	Ni-Al Self-Propagating High-Temperature Synthesis Catalysts in Dry Reforming of Methane to Hydrogen-Enriched Fuel Mixtures

			for the dry reforming of methane into a synthesis gas, which will further promote the organization of a new era of environmentally friendly energy-saving production methods.	
142.	Ni-Co-Zr composite catalysts for partial oxidation of natural gas	https://doi.org/10.32014/2518-1491.131	The results of research on the development of new effective catalysts for partial oxidation of methane to synthesis-gas or clean H_2-containing fuel are presented. The method of solution combustion synthesis was used to prepare Ni - Al - Mg/urea catalyst. The catalysts were characterized by XRD and SEM methods. Ni - Al - Mg/urea catalysts were prepared with different water contents in the initial catalyst mixture. The study was carried out on laboratory automated unit in quartz reactor at 700 - 900°C. The content of the gas mixture before and after the reaction was analyzed by the chromatographic method on a Chromos-1000 device. According to the research, it was found that the most optimal catalyst is 47% Ni - 2% Co - 1% Zr - 50% glycine - 36.15% Al - 13.85 % Mg for solution combustion synthesis. The optimum product yields and selectivity were recorded at 900°C: yield of H_2 57.3%, yield of CO 19.4% with selectivity up to 84.2% for H_2 and 57% for CO, H_2/CO ratio = 2.8 - 2.9 were obtained as a result of the research. The obtained results correlate with the data of physical and chemical methods. It has been shown that the catalysts contain simple and mixed oxides, metal aluminates and alloys, the presence of which contributes to the active operation of catalysts for the partial oxidation of methane.	Ni-Co-Zr composite catalysts for partial oxidation of natural gas
143.	AN INNOVATIVE WAY OF UNDERGROUND MINING	10.17580/em.2022.01.07	All engineering solutions in ore mining have their starting point, when the very idea of development of a new deposit appears. The creation of the required market for one or another commercial product extracted from the subsoil remains one of the most significant factors in development of civilization in the 21st century and, therefore, needs effective and preventive management of the condition and evolution of the production framework for the mining and metallurgical sector. Based on the foregoing, the conclusions have been made, that make it possible to create optimal conditions for the use of mineral raw materials in the development of the economy of the future, including modification of underground mining technologies which should radically change both from the standpoint of maintaining the natural balance of the subsoil and ecological cleanliness, as well as the comprehensive and maximum possible extraction completeness. One of the most optimal factors that effectively influence creation of a modern mine image is the underground mining technology and organization. The article shows the advantages of using the bottom-up method of	Alisheva Z.N., Oyunchabin Y.S., Bitimbaev M.Zh., Milstenko N.A. AN INNOVATIVE WAY OF UNDERGROUND MINING. Eurasian Mining, 2022, 37(1), pp. 38–40. DOI:10.17580/em.2022.01.07

			mining, when mining operations create a bottom-up stoping front not within one horizon as in the traditional concept, but conditions accessing of an ore body to the full depth and subsequent stoping in ascending series from the lower boundaries of the ore body (or whole deposit). The proposed method can be successfully applied in the hybrid technology with simultaneous and / or sequential use of open-pit and underground methods. Accessing via haulage ramps using self-propelled equipment in case of the bottom-up mining method enjoys a new application domain since it simultaneously takes on the role of ubiquitous operational exploration, because the ramps can be cut in ore, which allows stoping already during mine construction. At the same time, the volumes of waste rock excavation are significantly reduced. The proposed method of mining solves the important problems of reducing losses and dilution, increasing economic efficiency, including decrease in the capital costs and in the time of capital return, while ensuring mining safety and maintaining the natural balance of the subsoil.	
144.	Synthesis, characterization of silver/kaolinite nanocomposite and studying its antibacterial activity	https://doi.org/10.1016/j.colsurfb.2022.112908	В данной работе разработаны нанокомпозиты серебро/каолинит. Наночастицы серебра были получены на поверхности каолинита методом восстановления с использованием перекиси водорода в качестве восстановителя. Элементный, минеральный состав, структура и морфология природного каолинита и синтезированных нанокомпозитов были охарактеризованы рентгеновской дифрактометрией, ИК-спектроскопией, фотолюминесценцией (PL), дзета-потенциалом, сканирующей электронной микроскопией, просвечивающей электронной микроскопией и термогравиметрическим анализом. Антибактериальная активность нанокомпозитов AgNP/каолинит в отношении штаммов к грамположительному *Staphylococcus aureus* и грамотрицательному *Klebsiella pneumoniae*, *Escherichia coli* изучалась методом минимальной ингибирующей концентрации. Было показано, что полученный нанокомпозит AgNP/каолинит обладает антимикробным потенциалом. Проект реализован при финансовой поддержке Комитета науки МОН РК (грант №AP09561734, «Разработка условий получения многоцелового антибактериального композитного материала на основе казахстанского каолина»»). Благодарим Министерство образования и науки Республики Казахстан за поддержку данной работы.	Bekissanova, Z., Railean, V., Brzozowska, W., Wojtczak, I., Ospanova, A., Buszewski, B., & Sprynskyy, M. (2022). Synthesis, characterization of silver/kaolinite nanocomposite and studying its antibacterial activity. *Colloids and Surfaces B: Biointerfaces*, Vol. 220, P. 112908. https://doi.org/10.1016/j.colsurfb.2022.112908

145.	Preparation of composites of antibacterial materials based on bacterial cellulose and silver nanoparticles for wound healing	-	This study examined the preparation of composites of Bacterial Cellulose (BC) / silver nanoparticles (Ag NPs) using a substrate for the fermentation of the bacteria Gluconacetobacter xylinus C-3 and a reducing agent for the synthesis of silver nanoparticles in situ. The presence of silver in the BC/ Ag NPs composites was confirmed by various characterization tests.	Rakhimova B., Kudaibergenov K., Sassykova L., Spanova G., Aknazarov S., Tulepov M. Preparation of composites of antibacterial materials based on bacterial cellulose and silver nanoparticles for wound healing, International Journal of Nanoscience and Nanotechnology, 2022, 18(2), p.123-133.
146.	Synthesis, characterization of magnetic composites and testing of their activity in liquid-phase oxidation of phenol with oxygen	10.3390/chemengineering6050068	The purpose of this work is to obtain magnetic composites, determine their physicochemical characteristics and verify their activity in the process of liquid-phase oxidation of phenol with oxygen. Magnetic nanocomposites were obtained by chemical co-deposition of salts of ferrous and trivalent iron. The synthesized magnetic composites were studied by X-ray diffractometry, energy dispersive X-ray fluorescence and Mössbauer spectroscopy, IR-Fourier spectroscopy and elemental analysis. To increase the catalytic activity in oxidative processes, the magnetite surfaces were modified using cobalt nitrate salt. Further, CoFe2O4 was stabilized by adding polyethylenimine (PEI) as a surfactant.	Dossumova B.T., Shakiyeva T.V., Muktaly D., Sassykova L.R., Baizhomartov B.B., Subramanian S. Synthesis, characterization of magnetic composites and testing of their activity in liquid-phase oxidation of phenol with oxygen, ChemEngineering, 2022, 6(5), p.68. DOI:10.3390/chemengineering6050068
147.	Isothermic and Kinetic Study on Removal of Methylene Blue Dye Using Anisomeles malabarica Silver Nanoparticles: An Efficient Adsorbent to Purify Dye-Contaminated Wastewater, Adsorption Science and Technology	10.1155/2022/9878987.	Remediation of industrial discharged dyes to the water bodies is much needed in the current scenario. Here in this, we prepared silver nanoparticles using Anisomeles malabarica. The synthesized nanoparticles were characterized by Fourier transform infrared study, scanning electron microscopy, dynamic scanning calorimetry, and thermogravimetric analysis. All the characterization studies suggested that the formation of silver nanoparticles was successful. The synthesized silver nanoparticles were used as an adsorbent to adsorb the methylene blue.	Prabhahar M., Gomathi K., Venkatesh R., Stalany V. M., Vijayan D.S., Sassykova L. R., Sendilvelan S., Priya V. S., Jijina G.O., Selvaraj R. Isothermic and Kinetic Study on Removal of Methylene Blue Dye Using Anisomeles malabarica Silver Nanoparticles: An Efficient Adsorbent to Purify Dye-Contaminated Wastewater, Adsorption Science and Technology, 2022, vol. 2022,

				Article ID 9878987, 7 pages, 2022. DOI:10.1155/2022/9878987.
148.	Research of thermodynamic characteristics of a gas-generating composition based on ammonium perchlorate	-	The thermodynamic characteristics of combustion processes of a gas-generating composition based on ammonium perchlorate have been investigated. Polyethylene was chosen as a fuel, the choice in favor of this component is due to the fact that ammonium perchlorate readily interacts with polyethylene, and this fuel contributes to the rapid decomposition of ammonium perchlorate. The optimal composition of the mixture was found. It has been established that the highest efficiency and specific gas production are observed in the area of stoichiometric ratio of the initial components of gas generator compositions. The influence of the oxidizing agent ammonium perchlorate on the energy release of composite energetic materials, the thermal decomposition of ammonium perchlorate and ammonium perchlorate with polyethylene was studied by thermogravimetry and differential scanning calorimetry.	Amir Zh. A., Kudyarova Zh. B., Baiseitov D. A., Sassykova L. R., Golovchenko O. Y., Aknazarov S. Kh., Tulepov M. I., Orazbayev A. Ye., Gabdrashova Sh. E. Research of thermodynamic characteristics of a gas-generating composition based on ammonium perchlorate, ARPN Journal of Engineering and Applied Sciences, 2022, 17(10), 1040-1046.
149.	Catalytic cracking of M-100 fuel oil: relationships between origin process parameters and conversion products	10.15826/chimtech.2022.9.3.01.	This paper describes the study of the influence of technological modes on the yield and hydrocarbon composition of products formed because of cracking of commercial fuel oil and fuel oil M-100 in the presence of air in the reactor. For catalysts preparation, natural Taizhuzgen zeolite and Narynkol clay were used. It was found that the introduction of air into the reaction zone, in which oxygen is the initiator of the cracking process, significantly increases the yield of the middle distillate fractions. In the presence of air, the yield of diene and cyclodiene hydrocarbons significantly increases compared to cracking in an inert atmosphere.	Shakiyeva T.V., Sassykova L. R., Khamlenko A.A., Dzhatkambayeva U.N., Sassykova A.R., Batyrbayeva A.A., Zhaxibayeva Z.M., Ismailova A.G., Subramanian S. Catalytic cracking of M-100 fuel oil: relationships between origin process parameters and conversion products, Chimica Techno Acta, 2022, vol. 9(3), No. 20229301. DOI:10.15826/chimtech.2022.9.3.01.

150.	Activity features of catalysts for thermocatalytic hydrogenation processing of polymer wast	10.15826/chimtech.2022.9.3.02	The aim of this study was to obtain new catalysts for the processing of carbon-containing polymer waste based on polyethylene and polypropylene, represented mostly by lids from beverages bottled in plastic containers, which accumulate in huge quantities in landfills, by the method of thermocatalytic hydrogenation into liquid fuels and other products. The process was carried out in the presence of fuel oil as a binder, a source of hydrogen and additional hydrocarbons. Thus, two tasks can be solved simultaneously: recycling the polymer waste and obtaining the alternative raw materials from the polymer waste in order to save resources and improve the environmental situation in general. New catalysts based on activated zeolite modified with Mo(VI) and W(VI) salts of various concentrations for the thermocatalytic hydrogenation processing of waste plastics into motor fuels were synthesized.	Tashmukhambetova Z., Kalamgali T. O., Aubakirov Y. A., Sassykova L. R., Akhmetova F. Zh., Alpysbay A. S. Activity features of catalysts for thermocatalytic hydrogenation processing of polymer waste, Chimica Techno Acta, 2022, vol. 9(3), No. 20229302. DOI: 10.15826/chimtech.2022.9.3.02
151.	Multilayer Perceptron Mode and IoT to Assess the Economic Impact and Human Health in Rural Areas–Alcoholism	10.1201/9781003217398-7	The most notable health risk is the use of alcohol. Alcohol consumption, when exceeds the limit, causes an alarming situation where the person is prone to various diseases like liver cirrhosis, increase blood pressure, mental disorders, impotency, road accidents, and violence under the influence of alcohol. Although several reports have been submitted regarding the existence of addiction to alcohol among males in villages, the exact reason for alcohol addiction and its psychological, socio-economic impacts remains unknown and is a challenge for exploration by the data analyst. Various types of alcoholism and problems faced by the drinker have been analyzed using statistical data collected in the villages, Internet of Things-based alcohol monitoring on the Blynk app, and gas sensors.	Ann Roseela Jayaprakash, T Nalini, LR Sassykova, N Kanimozhi, S Geetha, K Bhaskar, K Gomathi, S Sendilvelan, Multilayer Perceptron Mode and IoT to Assess the Economic Impact and Human Health in Rural Areas–Alcoholism, Chapter in: Internet of Things and Data Mining for Modern Engineering and Healthcare Applications, 107-128, Chapman and Hall/CRC. DOI: 10.1201/9781003217398-7
152.	Preparation of briquettes on the basis of sub-standard coal of Kazakhstan fields	10.23939/chcht16.01.118	A technology of briquetting of sub-standard coal of Kazakhstan fields to obtain high-quality briquetting fuel has been developed. A modifying additive in the form of oil residues has been selected, that make it possible to obtain a binder composition for brown coal briquetting. The material for the preparation of coal briquettes is coal fines from dry,	Tulepov M., Sassykova L., Kerimkulova A., Tureshova G., Abdrakova F., Zhapekova A., Sultanova Z., Spanova G., Tolep D., Gabdrashova Sh., Baiseitov D., Preparation of

			poorly sintered coals, which cannot be used for direct combustion in the furnace. The optimal parameters for obtaining high-quality fuel briquettes have been determined. The results of the performed studies show the possibility and prospects of using local raw materials for the development of high-quality briquetted brown coal fuel.	briquettes on the basis of sub-standard coal of Kazakhstan fields, Chemistry and Chemical Technology, 2022, Vol. 16, No. 1, 118–125. DOI: 10.23939/chcht16.01.118
153.	Modified vermiculite of the Mugodzhary deposit and its sorption properties		The composition and the sorption properties of vermiculite from Mugodzhary field (Kazakhstan) were studied. The sorption properties of modified vermiculite were investigated under mechano-chemical activation in the presence of acidic sodium phosphate, Na2HPO4· 12H2O. Optimization of the mechano-chemical activation of vermiculite in the presence of Na2HPO4· 12H2O was carried out depending on the duration of mechano-chemical activation and the ratio of the mass of the substance to the mass of the balls. The results of the experiments showed that the degree of sorption of the activated vermiculite with respect to Mn2+ is higher than that of Ni2+, Cu2+. The results of sorption indicate an improvement in the properties of the sorption capacity during the formation of an amorphous phase when processing vermiculite with Na2HPO4· 12H2O.	Balgysheva B., Massalimov I., Urakaev F., Sassykova L., Zhakirova N., Boranbayeva G., Dalabayeva N., Azatkyzy S. Modified vermiculite of the Mugodzhary deposit and its sorption properties, Journal of Chemical Technology and Metallurgy, 2022, 57(3), pp.533-544.
154.	Modified zeolite catalysts for efficient processing of n-hexane and gasoline fraction	10.31788/RJC.2022.1548077	In this work hydrogen-free processing (in the absence of hydrogen) and hydrotreating of n-hexane and straight-run petrol fraction on the catalysts samples “C-1” (La-ZSM-Al2O3) and “C-2” (Ni-Mo-La-P-ZSM-Al2O3) were studied. “C-2” catalyst has high activity in both studied processes. The conversion of n-hexane during hydrogen-free processing on the “C-2” catalyst in the range of 350-500ºC increased from 58.8 to 90.7%; the octane rating of the final product in the temperature range of 350-500 ºC was within 55.1-87.9 according to the research method (RM), and from 61.4 to 84.9 according to the motor method (MM). The octane rating of hydrotreating products increases mainly due to an increase in the content of isoalkanes. The octane rating of the resulting gasoline is significantly higher than that of the original straight-run gasoline (73.1 (RM), 54.1 (MM)), and it reaches 92.1 (RM) and 81.7 (MM).	Tuktin B.T., Omarova A.A., Sassykova L.R., Saidilda G.T., Khamlenko A.A., Sendilvelan S., Tulepov M.I., Modified zeolite catalysts for efficient processing of n-hexane and gasoline fraction, Rasayan Journal of Chemistry, 15(4), 2022, 2442-2449. DOI: 10.31788/RJC.2022.1548077

155.	A comprehensive review of template-assisted porous carbons: Modern preparation methods and advanced applications	https://doi.org/10.1016/j.mser.2022.100682	Carbons with hierarchical pores in the range of few nanometers obtained via template-assisted methods offer a great control over structure and geometry of pores, keeping them uniformly distributed and better connected. Another advantage is the easy functionalization of templated porous carbons (TPCs) by various dopants, which makes them excellent materials for catalysis, energy storage and conversion, sensors and environmental applications. Herein, beyond zeolite-templated carbons, key methodologies based on the template material such as organic and metal oxides, silica, polymers, metal-organic framework (MOFs) and bio-originated materials used for the preparation of porous carbons possessing predetermined structure and composition, have been reviewed. The effects of precursor material on the textural and structural properties of TPCs have been described. In scope of applying novel methods such as evaporation induced self-assembling (EISA), the influence of different templates on the properties of resulting materials has been discussed. Further, advances on the template-induced synthesis of self-supporting metal-organic frameworks and their utilization as advanced templates have been described. Moreover, self-templates are especially emphasized, application of which in our opinion can provide a sustainable large-scale production of TPCs. The recent progress in the study of the diffusional processes, energy and biomedical applications as well as the confinement effects of different liquids and proteins within the porous matrices of template-derived carbons, have been reviewed.	Pavlenko V., Khosravi S.H., Żółtowska S., Haruna A.B., Zahid M., Mansurov Z., Supiyeva Zh., Galal A., Ozoemena K.I., Abbas Q., Jesionowski T. A comprehensive review of template-assisted porous carbons: Modern preparation methods and advanced applications Materials Science and Engineering: R: Reports, Vol. 149, 100682, 2022 https://doi.org/10.1016/j.mser.2022.100682 CiteScore 2021 - 43.0, 99% (Scopus).
156.	An asymmetric MnO2|activated carbon supercapacitor with highly soluble choline nitrate-based aqueous electrolyte for sub-zero temperatures	https://doi.org/10.1016/j.electacta.2022.140708	MnO2|activated carbon supercapacitors are attractive power devices that rival the electric double-layer capacitors (EDLCs) due to high reachable voltage. However, they greatly suffer from performance loss at low temperature as most of aqueous electrolytes freeze below ca. -10◦C. Here, a concentrated choline nitrate-based (5 mol/L aqueous ChNO3) electrolyte is applied to extend the working temperature range due to its eutectic-like properties. In such electrolyte, water acts as hydrogen bond donor for nitrate anion and low hydration energy for large choline cations favors ionic transport. The MnO2/CNT composite electrode with a	Schrade S., Zhao Z., Supiyeva Zh., Chen X., Dsoke S., Abbas Q. An symmetric MnO2|activated carbon supercapacitor with highly soluble choline nitrate-based aqueous electrolyte for sub-zero temperatures Electrochimica Acta, Vol. 425, 140708, 2022 https://doi.org/10.1016/j.electa

			hierarchical structure has been synthesized by hydrothermal process. The presence of CNTs as core component facilitates the electron conduction, while the two-dimensional MnO2 flakes grown on the surface provide electrolyte transport pathways and improve the interfacial processes (pseudocapacitive charge/discharge). Thanks to the low hydration of choline cation, the individual activated carbon (AC, negative) and MnO2/CNT (positive) electrodes are charged symmetrically up to a cell voltage of 1.8 V. Overall, due to the wide electrochemical stability window (~2.0 V) and anti-freezing properties of ChNO3-based aqueous electrolyte and the hierarchical design of the MnO2/CNT composite, the asymmetric supercapacitor operates down to -40 ◦C and displays excellent energy and coulombic efficiency with no loss of performance after several thousand cycles. This work provides a new possibility on the low temperature application of high voltage supercapacitors.	cta.2022.140708 CiteScore 2021 - 12.3, 93% (Scopus).
157.	Zh. K. Myltykbayeva, Zh. T. Yeshova, M. B. Smaiyl. Thermal methods of solid fuel processing: review	Oil Shale, 2022, Vol. 39, No. 3, pp. 217–240 doi: https://doi.org/10.3176/oil.2022.3.04	Abstract. A review of literature data on the processing of solid types of combustible fossils into liquid fuels and chemical products has been carried out. The reserves of solid fossil fuels far exceed the natural resources of oil and gas, so the development of methods for processing solid fossil fuels into chemical products and liquid fuels is an urgent task. The main methods of processing coal and oil shale (OS) are reduced to pyrolysis and supercritical gasification. Pyrolysis is preferred for processing oil shale into shale oil, and currently a promising method for processing coal is extraction with supercritical solvents such as water and CO2 at temperatures up to 900 °C and in some cases with the addition of a catalyst. For oil shale, the gasification process, like pyrolysis, is carried out under milder conditions, since the mineral part of oil shale contains trace elements that act as catalysts, and the structure of the organic part of oil shale is more similar in composition to oil.	Oil Shale, 2022, Vol. 39, № 3, pp. 207-240.