

INFORMATION
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DEPARTMENT OF PHYSICS AND 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)
Кафедра теоретической и ядерной физики				
1.	Elena Dmitrieva, Anastasiya Fedosimova, Igor Lebedev, Abzal Temiraliev, Medeu Abishev, Tolegen Kozhamkulov, Andrey Mayorov and Claudio Spitaleri	DOI 10.1088/1361-6471/ab67e7	An approach for measuring energy of cosmic-ray particles with energies $E > 10^{12}$ eV using an ultrathin calorimeter is presented. The method is based on the analysis of the correlation dependence of the cascade size on the rate of development of the cascade process. In order to determine the primary energy, measurements are made based on the number of secondary particles in the cascade, N_e , at two observation levels Z_1 and Z_2 , separated by an absorber layer. Based on the obtained measurements, a correlation analysis of the dependence of	Determination of the primary energy using an ultrathin calorimeter J. Phys. G: Nucl. Part. Phys. 47 035202, 2020

			<p> $\log N_e(Z_1)$ on the difference $dN = \log N_e(Z_1) - \log N_e(Z_2)$ is carried out. The correlation curves ($\log N_e$ from dN) in the negative part of the dN axis are almost parallel to each other and practically do not depend on the depth of the cascade development. It makes it possible to determine the primary energy using an ultrathin calorimeter. The best option for applying the method is a calorimeter, which has a unit with a heavy target, leading to the rapid development of the cascade, and a homogeneous measuring and absorption block. © 2020 The Author(s). Published by IOP Publishing Ltd. </p>	
2.	<p> Nassurlla M., Burtebayev N., Sadykov T.Kh., Boztosun I., Amangeldi N., Alimov D., Kerimkulov Zh., Burtebayeva </p>	<p> DOI 10.1140/epja/s1005 0-021-00539-z </p>	<p> The angular distributions of ^{13}C elastically scattered by ^9Be nuclei were measured at $E_{\text{Lab}}(^{13}\text{C}) = 16.25$ and 19.5 MeV. The measured angular distributions were analyzed via the optical model and the DWBA within the coupled reaction channels methods. In addition to this, the previously obtained data were reanalyzed at energies $E_{\text{Lab}} =$ </p>	<p> New measurements and reanalysis of ^{14}N elastic scattering on ^{10}B target Chinese Physics C, V.44(10), P.104103, 2020 </p>

	J., Nassurlla, M., Kurakhmedov A., Sakuta S.B., Karakoc M., Ibraheem A.A., Kemper K.W., Hamada Sh.		22.75, 28.12, 36.15, 57.77 and 72.88 MeV. The aim of the study was to elucidate the role of the α -cluster transfer mechanism in the large-angle scattering. As a result of these calculations, the optimal parameters of the potentials and their energy dependence were obtained for $^{13}\text{C}+^9\text{Be}$ nuclear system. The data at the backward angles are fairly well reproduced. The spectroscopic amplitudes were extracted for the $^{13}\text{C} \rightarrow ^9\text{Be} + \alpha$ configuration at various energies. The results are compared with previously reported values. © 2021, The Author(s), under exclusive licence to Società Italiana di Fisica and Springer-Verlag GmbH Germany, part of Springer Nature.	
3.	Boshkayev K., Konysbayev T., Kurmanov E., Luongo O., Muccino M.	DOI 10.3390/galaxies8040074	We investigate the dark matter distribution in the spiral galaxy ESO0140040, employing the most widely used density profiles: the pseudo-isothermal, exponential sphere, Burkert, Navarro-Frenk-White, Moore and Einasto profiles. We infer the model parameters and	Imprint of pressure on characteristic dark matter profiles: The case of ESO0140040 Galaxies, 2020, 8(4), c. 1-13, 74

			<p>estimate the total dark matter content from the rotation curve data. For simplicity, we assume that dark matter distribution is spherically symmetric without accounting for the complex structure of the galaxy. Our predictions are compared with previous results and the fitted parameters are statistically confronted for each profile. We thus show that although one does not include the galaxy structure it is possible to account for the same dynamics assuming that dark matter provides a non-zero pressure in the Newtonian approximation. In this respect, we solve the hydrostatic equilibrium equation and construct the dark matter pressure as a function for each profile. Consequently, we discuss the dark matter equation of state and calculate the speed of sound in dark matter. Furthermore, we interpret our results in view of our approach and we discuss the role of the refractive index as an observational signature to discriminate between our approach and the standard one.</p>	
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4.	Boshkayev K., Luongo O., Muccino M.	DOI 10.1140/epjc/s1005 2-020-08533-3	We investigate neutrino oscillation in the field of an axially symmetric space-time, employing the so-called q-metric, in the context of general relativity. Following the standard approach, we compute the phase shift invoking the weak and strong field limits and small deformation. To do so, we consider neutron stars, white dwarfs and supernovae as strong gravitational regimes whereas the solar system as weak field regime. We argue that the inclusion of the quadrupole parameter leads to the modification of the well-known results coming from the spherical solution due to the Schwarzschild space-time. Hence, we show that in the solar system regime, considering the Earth and Sun, there is a weak probability to detect deviations from the flat case, differently from the case of neutron stars and white dwarfs in which this	Neutrino oscillation in the q-metric European Physical Journal C, 2020, 80(10), 96

			<p>probability is larger. Thus, we heuristically discuss some implications on constraining the free parameters of the phase shift by means of astrophysical neutrinos. A few consequences in cosmology and possible applications for future space experiments are also discussed throughout the text. © 2020, The Author(s).</p>	
5.	<p>Boshkayev K., Idrissov A., Luongo O., Malafarina D.</p>	<p>DOI 10.1093/mnras/staa1564</p>	<p>We consider the observational properties of a static black hole space-time immersed in a dark matter envelope. We investigate how the modifications to geometry induced by the presence of dark matter affect the luminosity of the black hole's accretion disc. We show that the same disc luminosity as produced by a black hole in vacuum may be produced by a smaller black hole surrounded by dark matter under certain conditions. In particular, we demonstrate that the luminosity of the disc is markedly altered by the presence of dark matter, suggesting that the mass estimation of distant supermassive black holes may</p>	<p>Accretion disc luminosity for black holes surrounded by dark matter Monthly Notices of the Royal Astronomical Society, 2020, 496(2), c. 1115-1123</p>

			<p>be changed if they are immersed in dark matter. We argue that a similar effect holds in more realistic scenarios, and we discuss the refractive index related to dark matter lensing.</p> <p>Finally, we show how the results presented here may help to explain the observed luminosity of supermassive black holes in the early Universe. © 2020 The Author(s) Published by Oxford University Press on behalf of the Royal Astronomical Society</p>	
6.	<p>Dubovichenko, S.B., Burkova, N.A., Dzhazairov-Kakhramanov, A.V., Tkachenko, A.S.</p>	<p>DOI 10.1016/j.astropartphys.2020.102481</p>	<p>Within the framework of the modified potential cluster model with a classification of orbital states according to Young diagrams, the possibility of describing experimental data for total cross sections of the neutron radiative capture on ^{11}B to the ground state of ^{12}B at energies of 10 meV ($1 \text{ meV} = 10^{-3} \text{ eV}$) to 7 MeV was considered. It was shown that, taking into account only the E1 transition from the S state of the $n^{11}\text{B}$ scattering to the ground state of ^{12}B, it is quite possible to</p>	<p>Influence of resonances on the $^{11}\text{B}(n,\gamma)^{12}\text{B}$ capture reaction rate. Capture to the ground state of ^{12}B Astroparticle Physics, Volume 123, 102481, 2020</p>

			<p>explain the magnitude of the known experimental cross sections at energies of 25.3 meV to 70 keV. Furthermore, on the basis of the total cross sections of 10 meV to 7 MeV, but excluding resonances above 5 MeV, the reaction rate is calculated in the temperature range of 0.01 to 10.0 T₉. It is shown that the inclusion of low-lying resonance states makes a significant contribution to the reaction rate, starting already with temperatures of 0.2–0.3 T₉. © 2020</p>	
7.	Vladimir Dzhunushaliev, Vladimir Folomeev	DOI 10.1142/S02198878 20501923	<p>Within F(B2) modified Weyl gravity, we consider a model of a spin-1/2 electric charge consisting of interior and exterior regions. The interior region is determined by quantum gravitational effects whose approximate description is carried out using Weyl gravity nonminimally coupled to a massless Dirac spinor field. The interior region is embedded in exterior Minkowski spacetime, and the joining surface is a two-dimensional torus. It is shown</p>	<p>Model of a spin-1/2 electric charge in F(B2) modified Weyl gravity International Journal of Geometric Methods in Modern Physics Vol. 17, No. 13 (2020) 2050192</p>

			that mass, electric charge, and spin of the object suggested may be the same as those for a real electron. © 2020 World Scientific Publishing Company.	
8.	Vladimir Dzhunushaliev, Vladimir Folomeev	DOI 10.1140/epjc/s1005 2-020-08633-0	<p>We consider non-Abelian SU(3) Proca theory with a Higgs scalar field included. Cylindrically symmetric solutions describing classical tubes either with the flux of a longitudinal electric field or with the energy flux (and hence with nonzero momentum density) are obtained. It is shown that, in quantum Proca theory, there can exist tubes both with the flux of the longitudinal electric field and with the energy flux/momentum density simultaneously. An imaginary particle – Proca proton – in which ‘quarks’ are connected by tubes with nonzero momentum density is considered. It is shown that this results in the appearance of the angular momentum related to the presence of the non-Abelian electric and magnetic fields in the tube, and this</p>	<p>Proca tubes with the flux of the longitudinal chromoelectric field and the energy flux/momentum density Eur. Phys. J. C, (2020) 80:1043</p>

			angular momentum is a part of the Proca proton spin. © 2020, The Author(s).	
9.	Vladimir Dzhunushaliev, Vladimir Folomeev	DOI 10.1142/S02198878 20501972	We consider the sets of Dirac-Maxwell and Rarita-Schwinger-Maxwell equations in $\mathbb{R} \times S^3$ spacetime. Using the Hopf coordinates, we show that these equations allow separation of variables and obtain the corresponding analytic and numerical solutions. It is also demonstrated that the current of the Dirac field is related to the Hopf invariant on the $S^3 \rightarrow S^2$ fibration. © 2020 World Scientific Publishing Company.	Dirac/Rarita–Schwinger plus Maxwell theories in $\mathbb{R} \times S^3$ spacetime in the Hopf coordinates International Journal of Geometric Methods in Modern Physics, Vol. 17, No. 13 (2020) 2050197 (17 pages)
10.	Vladimir Dzhunushaliev, Vladimir Folomeev	DOI 10.1142/S02198878 20501650	Within R^2 gravity, we study the linear stability of strongly gravitating spherically symmetric configurations supported by a polytropic fluid. All calculations are carried out in the Jordan frame. It is demonstrated that, as in general relativity, the transition from stable to unstable systems occurs at the maximum of the curve mass-central density of the fluid. © World Scientific Publishing Company	On the linear stability of polytropic fluid spheres in R^2 gravity International Journal of Geometric Methods in Modern Physics Vol. 17, No. 11 (2020) 2050165

11.	Vladimir Dzhunushaliev, Vladimir Folomeev, Tlekkabul Ramazanov and Tolegen Kozhamkulov	DOI 10.1142/S02177323 20501941	<p>We consider thermodynamic properties of a quark-gluon plasma related to quasiparticles having the internal structure. For this purpose, we employ a possible analogy between quantum chromodynamics and non-Abelian Proca-Dirac-Higgs theory. The influence of characteristic sizes of the quasiparticles on such thermodynamic properties of the quark-gluon plasma like the internal energy and pressure is studied. Sizes of the quasiparticles are taken into account in the spirit of the van der Waals equation but we take into consideration that the quasiparticles have different sizes, and the average value of these sizes depends on temperature. It is shown that this results in a change in the internal energy and pressure of the quark-gluon plasma. Also, we show that, when the temperature increases, the average value of characteristic sizes of the quasiparticles increases as well. This leads to the occurrence of a phase transition at the temperature at</p>	<p>Thermodynamics and statistical physics of quasiparticles within the quark gluon plasma model Modern Physics Letters A, Vol. 35, No. 23 (2020) 2050194</p>
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			<p>which the volume occupied by the quasiparticles is compared with the volume occupied by the plasma. © 2020 World Scientific Publishing Company.</p>	
12.	<p>Vladimir Dzhunushaliev, Vladimir Folomeev, Tlekkabul Ramazanov, Arislan Makhmudov and Tolegen Kozhamkulov</p>	<p>DOI 10.1088/1402-4896/ab9791</p>	<p>We consider non-Abelian Proca theories with extra fundamental fields included. In the case of SU(2) Proca theory with nonlinear scalar and spinor fields, we obtain spherically symmetric regular solutions describing particlelike configurations with finite energy. For such systems, we find the energy spectrum and show the presence of a mass gap. In the case of SU(3) Proca theory with a nonlinear scalar field, we obtain cylindrically symmetric solutions describing tubes either with the flux of a longitudinal electric field or with the energy flux or with both of them. It is shown that the tubes with the energy flux may contribute considerably to the Proca proton spin. Consistent with all of this, we have argued that non-Abelian Proca theories containing extra</p>	<p>Non-Abelian Proca theories with extra fields: particlelike and flux tube solutions Phys. Scr. 95 (2020) 074013 (7pp)</p>

			fields may approximately describe some phenomena in QCD. © 2020 IOP Publishing Ltd.	
13.	A. Shepetov, A. Chubenko, B. Iskhakov, O. Kryakunova, O. Kalikulov, S. Mamina, K. Mukashev, V . Piscal, V. Ryabov, N. Saduyev, T. Sadykov, N. Salikhov, E. Tautaev, L. Vil'danova, V . Zhukov	DOI 10.1140/epjp/s1336 0-019-00092-1	Purposeful investigation of radiation fluxes strongly delayed in relation to the main particle front of extensive air shower (EAS) was undertaken at the Tien Shan Mountain Cosmic Ray Station. It was found that the passage of the EAS can be accompanied by the delayed thermal neutrons and by the soft (30–50) keV gamma rays, mostly concentrated within a region of about (5–10) m around the shower axis, where the integral radiation fluence can vary in the limits of $(10^{-4} - 1) \text{ cm}^{-2}$ for neutrons, and of (0.1 - 1000) cm^{-2} for gamma rays. The dependence of signal multiplicity on the shower size N_e has a power shape both for the neutron and gamma ray components, with a sharp increase of its power index around the value of $N_e \approx 10^6$, which corresponds to the position of the 3×10^{15} eV knee in the primary cosmic ray	Measurements of the low-energy neutron and gamma ray accompaniment of extensive air showers in the knee region of primary cosmic ray spectrum European Physical Journal Plus, 135, 2020

			<p>spectrum. The total duration of detectable radiation signal after the EAS passage can be of some tens of milliseconds in the case of neutron component, and up to a few whole seconds for gamma rays. The delayed accompaniment of low-energy radiation particles can be an effective probe to study the interaction of the hadronic component of EAS. © 2020, Società Italiana di Fisica (SIF) and Springer-Verlag GmbH Germany, part of Springer Nature.</p>	
14.	<p>Zhusupov M.A., Zhaksybekov a K. A., Kabatayeva R. S</p>	<p>DOI 10.3103/S10628738 20100317</p>	<p>Abstract: The excitation spectra of the ^{10}B nucleus in the lithium reactions of triton and α-particle cluster transfer were calculated via summation of the corresponding spectroscopic S-factors within the multiparticle shell model. It is shown that the difference between the excitation spectra of the ^{10}B nucleus in the lithium reactions of α-cluster transfer on ^6Li nucleus and in the reaction of $^6\text{Li}(\alpha, \gamma)^{10}\text{B}$ radiative capture is due to structural features of the states of the ^{10}B nucleus in the near-</p>	<p>Cluster Structure of ^{10}B Nucleus Levels Bull. Russian Ac. of Sc. Phys. – 2020. –V. 84, No. 10. – P. 1175–1178</p>

			threshold region. © 2020, Allerton Press, Inc.	
15.	A.V. Yushkov, V. V. Dyachkov, Y A. Zaripova	DOI 10.3103/S10628738 20100305	<p>Abstract: Multineutron coupled systems (quasi-nuclei) have yet to be found, despite numerous targeted searches.</p> <p>However, a number of theoretical studies show that the existence of multineutron systems is possible. A new direct approach to detecting multineutron systems is proposed using kinematic features of elastic scattering. The critical angles of multineutrons with respect to the closest lightest nuclei are calculated, demonstrating the clear kinematic difference between dineutrons (2n), trineutrons (3n), and tetra-neutrons (4n). © 2020, Allerton Press, Inc.</p>	A New Approach to the Experimental Detection and Study of Multineutrons Bulletin of the Russian Academy of Sciences: Physics, 2020, 84(10), P. 1183-1186
16.	Y. Mukhamejanov, G. Alieva, D. Alimov, G. Kabdrakhimova, M. Nassurlla, N. Saduyev B.M.	DOI 10.5506/APhysPolB .51.783	<p>Double-differential and integral cross sections of the (p, xp) and (p, xα) reactions on the ^{103}Rh nucleus were measured at $E_p = 30$ MeV using a proton beam delivered by the U-150M cyclotron of the Institute of Nuclear Physics (Almaty, Kazakhstan). A self-</p>	Investigation of (p,xp) and (p,x α) Reactions of 30-MeV Protons with the ^{103}Rh Nucleus Acta Physica Polonica B, V51(3), P.783, 2020

	Sadykov, T.K. Zholdybayev, K.M. Ismailov, Y. Kucuk		sustaining ^{103}Rh foil of 3 μm thickness was used as a target. The obtained experimental results were compared with the TENDL-2019 nuclear data library, which provides the output of the TALYS nuclear model code. We assert that the TENDL-2019 evaluations provide a valid description of the obtained experimental data. © 2020 Jagellonian University. All rights reserved.	
17.	M. Muccino, L. Izzo, O. Luongo, K. Boshkayev, L. Amati, M. Della Valle, G. B. Pisani, E. Zaninoni.	DOI 10.3847/1538- 4357/abd254	Observations of gamma-ray bursts up to $z \sim 9$ are best suited to study the possible evolution of the universe equation of state at intermediate redshifts. We apply the Combo relation to a sample of 174 gamma-ray bursts to investigate possible evidence of evolving dark energy parameter $w(z)$. We first build a gamma-ray burst Hubble's diagram and then we estimate the set $(\Omega_m, \Omega_\Lambda)$ in the framework of flat and non-flat Λ CDM paradigm. We then get bounds over the w CDM model, where w is thought to evolve with redshift, adopting two priors over the Hubble	Tracing Dark Energy History with Gamma-Ray Bursts The Astrophysical Journal (2021), 908:181 (11pp)

			<p>constant in tension at 4.4σ, i.e., $H_0 = (67.4 \pm 0.5) \text{ km s}^{-1} \text{ Mpc}^{-1}$ and $H_0 = (74.03 \pm 1.42) \text{ km s}^{-1} \text{ Mpc}^{-1}$. We show our new sample provides tighter constraints on Ω_m since at $z \leq 1.2$ we see that $w(z)$ agrees within 1σ with the standard value $w = -1$. The situation is the opposite at larger z, where gamma-ray bursts better fix $w(z)$ that seems to deviate from $w = -1$ at 2σ and 4σ level, depending on the redshift bins. In particular, we investigate the $w(z)$ evolution through a piecewise formulation over seven redshift intervals. From our fitting procedure we show that at $z \geq 1.2$ the case $w < -1$ cannot be fully excluded, indicating that dark energy's influence is not negligible at larger z. We confirm the Combo relation as a powerful tool to investigate cosmological evolution of dark energy. Future space missions will significantly enrich the gamma-ray burst database even at smaller redshifts, improving de facto the results discussed in this paper. © 2021. The</p>	
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			American Astronomical Society. All rights reserved..	
18.	K. Boshkayev, T. Konysbayev, E. Kurmanov, O. Luongo, M. Muccino	DOI 10.3390/galaxies8040074	<p>We investigate the dark matter distribution in the spiral galaxy ESO0140040, employing the most widely used density profiles: the pseudo-isothermal, exponential sphere, Burkert, Navarro-Frenk-White, Moore and Einasto profiles. We infer the model parameters and estimate the total dark matter content from the rotation curve data. For simplicity, we assume that dark matter distribution is spherically symmetric without accounting for the complex structure of the galaxy. Our predictions are compared with previous results and the fitted parameters are statistically confronted for each profile. We thus show that although one does not include the galaxy structure it is possible to account for the same dynamics assuming that dark matter provides a non-zero pressure in the Newtonian approximation. In this respect, we solve the hydrostatic equilibrium equation and construct the dark matter pressure as a function</p>	<p>Imprint of Pressure on Characteristic Dark Matter Profiles: The Case of ESO0140040 Galaxies (2020), 8, 74</p>

			<p>for each profile. Consequently, we discuss the dark matter equation of state and calculate the speed of sound in dark matter. Furthermore, we interpret our results in view of our approach and we discuss the role of the refractive index as an observational signature to discriminate between our approach and the standard one.</p> <p>© 2020 by the authors. Licensee MDPI, Basel, Switzerland.</p>	
19.	<p>Burkova, N.A., Dubovichenko, S.B., Dzhazairov-Kakhramanov, A.V., Nurakhmetova, S.Z.</p>	<p>DOI 10.1088/1361-6471/abe2b5</p>	<p>Within the framework of the modified potential cluster model with forbidden states and their classification according to Young diagrams, the possibility of describing experimental data on the total cross sections of the neutron radiative capture on ${}^7\text{Li}$ is considered. It is shown that the model used and the methods for constructing potentials make it possible to correctly describe the behavior of experimental cross sections at energies of 1 meV to 1.5 MeV, where experimental data are available. Based on the calculated total cross sections</p>	<p>Comparative role of the ${}^7\text{Li}(n, \gamma)$ reaction in Big Bang nucleosynthesis Journal of Physics G: Nuclear and Particle Physics, 2021, V 48(4), 045201 (21pp)</p>

			<p>up to 5 MeV, the reaction rate is calculated and its analytical approximation is carried out. Resonance structure of ${}^7\text{Li}(n, \gamma){}^8\text{Li}$ cross section and its impact on the reaction rate is examined. It is shown that the ${}^7\text{Li}(n, \gamma){}^8\text{Li}$ reaction dominates at $T_9 < 0.1$ as opposed to the burning of ${}^7\text{Li}$ in the ${}^7\text{Li}({}^3\text{H}, n){}^9\text{Be}$ and ${}^7\text{Li}({}^4\text{He}, \gamma){}^{11}\text{B}$ reactions, but comparable to (d, γ), (d, p), and (p, γ) at $T_9 \sim 1$. © 2021 IOP Publishing Ltd Printed in the UK</p>	
20.	<p>Dubovichenko, S.B., Burkova, N.A., Dzhazairov-Kakhramanov, A.V., Yertaiuly, A.</p>	<p>DOI 10.1016/j.nuclphysa .2021.122197</p>	<p>The total cross sections of the neutron radiative capture on ${}^{12}\text{B}$ at astrophysical energies to the ground state of ${}^{13}\text{B}$, have been calculated in the energy range of 10^{-8} to 10 MeV within the framework of a modified potential cluster model with the classification of orbital states according to Young diagrams. Reaction rates in the temperature range of 0.01 to 10 T_9, and their analytical parameterizations were obtained. The calculated rates of ${}^{12}\text{B}(n, \gamma){}^{13}\text{B}$ excess the previous results obtained by</p>	<p>${}^{12}\text{B}(n, \gamma){}^{13}\text{B}$ reaction as an alternative path to astrophysical synthesis of ${}^{13}\text{C}$ isotope Nuclear Physics A, 2021, V 1011, P. 122197 (17pp)</p>

			<p>other approaches by approximately to one order of magnitude. Cross sections and reaction rates of $^{12}\text{C}(n,\gamma_{0+1+2+3})^{13}\text{C}$ are calculated and compared to the $n^{10}\text{B}$, $n^{11}\text{B}$, $n^{12}\text{B}$, and $p^{12}\text{C}$ reaction rates. It is proposed that the obtained rates of the $^{12}\text{B}(n,\gamma)^{13}\text{B}$ reaction may be suggested for the discussion of novel scenarios of stable isotope ^{13}C synthesis when p-captures on ^{12}C are not present.</p> <p>© 2021 Elsevier B.V.</p>	
21.	<p>Bahtiyar Sadykov, Timur Zholdybayev, Nassurlla Burtebayev, Bek Duisebayev, Maulen Nassurlla, Jumazyia Burtebayeva, Marzhan Nassurlla, Stanislav Sakuta, Andrey Pan</p>	<p>DOI 10.1140/epja/s1005-0-021-00415-w</p>	<p>Differential cross sections of elastic and inelastic scattering with excitation of states of the rotational band of the ground state of ^{24}Mg were measured at an α-particle energy of 50.5 MeV and ^3He 60 MeV. The angular distributions were analyzed using an optical model and a coupled channel method. A number of potentials with significantly different geometries are obtained, which describe well the elastic scattering at the measured angular range. The collective model was used in the calculations via the coupled</p>	<p>Scattering of α-particles and ^3He by ^{24}Mg nuclei at energies about 50–60 MeV European Physical Journal A Volume 57, Issue 4, April 2021, Номер статъи 130</p>

			<p>channel method. In addition to the ground state, three low-lying states of ^{24}Mg, 2^+ (1.368 MeV), 4^+ (4.122 MeV), and 4.238 MeV (2^+), were included in the coupling scheme. The values of quadrupole (β_2) and hexadecapole (β_4) deformation parameters were extracted. According to the analysis of scattering of α-particles, they are 0.52 and 0.05. For ^3He, they are 0.75 and 0.07, respectively. The extracted parameters correspond to the previously obtained values from the scattering of protons, deuterons and α-particles. © 2021, The Author(s), under exclusive licence to Società Italiana di Fisica and Springer-Verlag GmbH Germany, part of Springer Nature.</p>	
22.	V. Dzhunushaliev and V. Folomeev	DOI 10.1140/epjc/s10052-021-09188-4	<p>Within vacuum Weyl gravity, we obtain a solution by which, using different choices of the conformal factor, we derive metrics describing (i) a bounce of the universe; (ii) toroidal and spherical wormholes; and (iii) a change in metric signature. It is demonstrated that singularities occurring in</p>	<p>Masking singularities in Weyl gravity and Ricci flows Eur.Phys.J.C 81 (2021) 5, 387</p>

			<p>these systems are “masked”. We give a simple explanation of the possibility of masking the singularities within Weyl gravity. It is shown that in the first and third cases the three-dimensional metrics form Ricci flows. The question of the possible applicability of conformal Weyl gravity as some phenomenological theory in an approximate description of quantum gravity is discussed. © 2021, The Author(s).</p>	
23.	V. Dzhunushaliev and V. Folomeev,	DOI 10.3390/universe7030065	<p>We consider the Dirac equation and Maxwell’s electrodynamics in $\mathbb{R} \times S^3$ spacetime, where a three-dimensional sphere is the Hopf bundle $S^3 \rightarrow S^2$. In both cases, discrete spectra of classical solutions are obtained. Based on the solutions obtained, the quantization of free, noninteracting Dirac and Maxwell fields is carried out. The method of nonperturbative quantization of interacting Dirac and Maxwell fields is suggested. The corresponding operator equations and the infinite set of the Schwinger–</p>	<p>Nonperturbative quantization approach for QED on the Hopf bundle Universe 7, (2021) no.3, 65</p>

			<p>Dyson equations for Green's functions is written down. We write a simplified set of equations describing some physical situations to illustrate the suggested scheme of nonper-turbative quantization. Additionally, we discuss the properties of quantum states and operators of interacting fields. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.</p>	
24.	<p>V. Dzhunushaliev, V. Folomeev and Tlemisov, A</p>	<p>DOI 10.3390/sym13040640</p>	<p>In this work, we study cylindrically symmetric solutions within SU(3) non-Abelian Proca theory coupled to a Higgs scalar field. The solutions describe tubes containing either the flux of a color electric field or the energy flux and momentum. It is shown that the existence of such tubes depends crucially on the presence of the Higgs field (there are no such solutions without this field). We examine the dependence of the integral characteristics (linear energy and momentum densities) on the values of the electromagnetic potentials at the center of the tube, as well</p>	<p>Linear energy density and the flux of an electric field in proca tubes Symmetry, Volume 13, Issue 4, April 2021, Номер статьи 640</p>

			as on the values of the coupling constant of the Higgs scalar field. The solutions obtained are topologically trivial and demonstrate the dual Meissner effect: the electric field is pushed out by the Higgs scalar field. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.	
25.	Odsuren, M., Khuukhenkhuu, G., Sarsembayeva, A.T., Amangeldi, N., Katō, K.	DOI 10.1007/s12648-020-01994-y	We investigate the effects of resonant or virtual state and non-resonant contributions in continuum level density. In addition, we discuss the decomposed continuum level density and the M1 transition strength in the scattering problem in terms of the Green function with complex scaling method. © 2021, Indian Association for the Cultivation of Science.	Analysis of continuum level density for virtual and resonance states Indian Journal of Physics 2021
26.	Kashaykin P.F., Tomashuk A.L., Vasiliev S.A., Ignatyev A.D., Shaimerdenov A.A.,	DOI 10.1016/j.nme.2021.100981	Single-mode optical fibres (SMFs) are required for ITER in-vessel applications as transport fibres to deliver the signal at wavelength $\lambda = 1.55 \mu\text{m}$ from/to optical fibre sensors. The paper describes the first comparison study of radiation resistance of six pure-silica-core SMFs of different	Radiation resistance of single-mode optical fibres with view to in-reactor applications Nuclear materials and energy, V.27, P.100981, 2021.

	<p>Ponkratov Y.V., Kulsartov T.V., Kenzhin Y.A., Kh. Gizatulin S., Zholdybayev T.K., Chikhray Y.V., Semjonov S.L.</p>		<p>manufacturers performed in the process of fission-reactor irradiation in the conditions corresponding to the whole ITER lifetime (fast-neutron fluence, flux, γ-dose and dose rate of up to $1.8 \cdot 10^{20} \text{ n/cm}^2$, $1.08 \cdot 10^{14} \text{ n/(cm}^2 \cdot \text{s)}$, 2.32 GGy and 1.39 kGy/s, respectively, temperature of 170–190 °C and vacuum pumping). Polyimide- and acrylate-coated SMFs failed mechanically during the irradiation; therefore, only metal-coated fibres can be considered for the in-vessel applications. Induced optical loss in all three metal-coated SMFs (copper- and aluminum-coated ones) at the fast-neutron fluence of $1 \cdot 10^{20} \text{ n/cm}^2$ was found to lie in the range ~1.5–4 dB/m, the lower value of this range allowing the employment of at least 10-m-long transport fibre lengths in the in-vessel applications, assuming the dynamic range of 30 dB. The temperature-dependent microbending optical loss in metal-coated SMFs is discussed, of which the contribution to the total</p>	
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			induced loss may be comparable in value to the radiation-induced absorption of light. Neither radiation-induced luminescence, nor Cerenkov emission was detected in the SMFs in the near-infrared range. © 2021 The Author(s)	
Кафедра теплофизики и технической физики				
27.	Investigation of vapor cryodeposited glasses and glass transition of tetrachloromethane films	DOI: 10.1016/j.apsusc.2019.144857 Q1 Chemistry: General Chemistry	The vibrational spectra of CCl ₄ in the gas phase and in the condensed state were measured with a goal to compare them. The thickness of the condensed samples was $d = 2.5 \mu\text{m}$. It was shown that an increase in the temperature of the condensed sample leads to a change in the position of the absorption band. Based on the obtained dependence of the position of the absorption band on the temperature of the sample during its heating, an assumption is made that in the temperature range $T = 16 \text{ K} - T = 35 \text{ K}$ the cryocondensate film is in an amorphous high density state. Experiments were conducted to determine the glass transition temperature ($T_g = 79 \text{ K}$) in the sample by observing the half-width of the	Aldiyarov, A., Nurmukan, A., Sokolov, D., Korshikov, E. Investigation of vapor cryodeposited glasses and glass transition of tetrachloromethane films // Applied Surface Science, 2020, 507, 144857 DOI: 10.1016/j.apsusc.2019.144857 https://www.scopus.com/record/display.uri?eid=2-s2.0-85077181158&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			characteristic absorption band at a fixed frequency in the vibrational spectra versus temperature.	
28.	The study of thermophysical properties of rubber and plastic household waste to determine the temperature conditions of cryoprocessing	DOI: 10.1016/j.apsusc.2020.145487 Q1 Chemistry: General Chemistry	The effect of cryogenic treatment on the thermal characteristics emerged from the operation of automobile tires and plastic bottles of commercial beverages. Automobile tires manufactured according to the state standard "GOST 4754-97" (ISO 1043-1:2001 "Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics"; ISO 11469:2000 "Plastics – Generic identification and marking of plastics products"; ISO 472:1999 "Plastics – Vocabulary") and bottles made of polyethylene terephthalate for food liquids according to the state standard "GOST R 52789-2007" (ECE/TRANS/WP.29/GRB/2019/5 "Proposal for amendments to UN Regulation No. 30") were used as the test samples. Temperature range of investigation was 95–300 K. The thermal conductivity	Aldiyarov, A., Sokolov, D., Nurmukan, A., Korshikov, E. The study of thermophysical properties of rubber and plastic household waste to determine the temperature conditions of cryoprocessing // Applied Surface Science, 2020, 511, 145487 DOI: 10.1016/j.apsusc.2020.145487 https://www.scopus.com/record/display.uri?eid=2-s2.0-85079104677&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			measurements were carried out by a relative stationary heat flow method and the temperature change inside the samples with different forms on heating after cooling to nitrogen temperature. The results obtained are in good agreement with the literature data.	
29.	Refractive Index at Low Temperature of Tetrachloroethane and Tetrafluoroethane Cryovacuum Condensates	DOI: 10.1021/acsomega.0c00969 Q1 Chemical Engineering: General Chemical Engineering	We present low-temperature measurements of the refractive index of cryofilms of tetrachloromethane and 1,1,1,2-tetrafluoroethane at different condensation and measurement temperatures between 16 and 130 K. Using cryovacuum condensation, we have been able to obtain thin films in an amorphous state for both substances despite them being very bad glass formers. Then, we have studied the evolution of the refractive index with an increasing temperature, including by transitions to ordered or partially disordered crystalline states. Copyright	Aldiyarov, A.U., Sokolov, D.Y., Nurmukan, A.Y., Ramos, M.A. Refractive Index at Low Temperature of Tetrachloromethane and Tetrafluoroethane Cryovacuum Condensates // ACS Omega, 2020, 5(20), стр. 11671–11676 DOI: 10.1021/acsomega.0c00969 https://www.scopus.com/record/display.uri?eid=2-s2.0-85085873778&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1
30.	On thermal stability of cryovacuum deposited	DOI: 10.1063/10.0002156 Q3 Physics and Astronomy	Whereas stable homogenous states of aqueous hydrocarbon solutions are typically observed at high temperatures and pressures far beyond the critical	Aldiyarov, A., Sokolov, D., Akylbayeva, A., Nurmukan, A., Tokmoldin, N. On thermal stability of cryovacuum deposited CH ₄ +H ₂ O films // Low Temperature Physics, 2020, 46(11), стр. 1121–1124 DOI: 10.1063/10.0002156

	CH ₄ +H ₂ O films		<p>values corresponding to individual components, the stability of such system may be preserved upon transition into the region of metastable states at low temperatures and low pressures. This work is dedicated to the study of the thermal stability of a water-methane mixture formed by cryogenic vapor phase deposition. The obtained thin films were studied using vibrational spectroscopy in the temperature range of 16-180 K. During thermal annealing of the samples, characteristic vibrational C-H modes of methane were monitored alongside the chamber pressure to register both structural changes and desorption of the film material. The obtained results reveal that upon the co-deposition of methane and water, methane molecules appear both in non-bound and trapped states. The observed broadening of the characteristic C-H stretching mode at 3010 cm⁻¹ upon an increase in temperature of the sample from 16 to 90 K, followed by</p>	<p>https://www.scopus.com/record/display.uri?eid=2-s2.0-85097577823&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>
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			narrowing of the peak as the temperature is reduced back to 16 K, indicates localization of methane molecules within the water matrix at lower temperatures.	
31.	Mathematical modelling of the cryogenic-dynamic start-up process in a pneumatic installation	DOI: 10.1088/1742-6596/1661/1/012092 Q4 Physics and Astronomy: General Physics and Astronomy	For studying the kinetic laws of the processes of transitional phase processes of cryo-liquids into the vapor phase, methods of mathematical modelling were used. A mathematical model was developed for the instant boiling up of cryo-liquids using the finite element method. The paper shows the results of a numerical experiment with different amounts of evaporating cryo-liquid in the same temperature range. The dependences of Von Mises pressure and pressure during cryo-liquid evaporation are shown. These studies are necessary for further detailed study of the kinetic laws of the processes of fast-flow phase transitions of cryo-liquids in a pneumatic installation for the cryogenic-dynamic startup of devices.	Yerezhep, D., Aldiyarov, A., Sokolov, D., Nurmukan, A., Krutskikh, B., Amangeldieva, Z. Mathematical modelling of the cryogenic-dynamic start-up process in a pneumatic installation // Journal of Physics: Conference Series, 2020, 1661(1), 012092 DOI: 10.1088/1742-6596/1661/1/012092 https://www.scopus.com/record/display.uri?eid=2-s2.0-85096564770&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1
32.	Computer simulation of	DOI: 10.1088/1742-6596/1661/1/012091	The computer simulation model of the expansion of the liquid	Yerezhep, D., Aldiyarov, A., Sokolov, D., Nurmukan, A. Computer simulation of thermal expansion of the charge

	thermal expansion of the charge of liquid nitrogen in the process of heat load	Q4 Physics and Astronomy: General Physics and Astronomy	nitrogen charge during a heat load was created, and the Mises stress criterion was considered on the basis of theoretical and experimental data. The influence of the type of using temperature load was studied to generate calculated numerical data for creating fuel on liquid nitrogen. These studies are necessary for the formation of an additional numerical experiment to study the phase transition of liquid nitrogen to a gaseous state under conditions of a closed, and then sharply increasing (exponentially) volume, which is characterized as quasi-isobaric conditions.	of liquid nitrogen in the process of heat load // Journal of Physics: Conference Series, 2020, 1661(1), 012091 DOI: 10.1088/1742-6596/1661/1/012091 https://www.scopus.com/record/display.uri?eid=2-s2.0-85096623788&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1
33.	A multifaceted approach for cryogenic waste tire recycling	DOI: 10.3390/polym13152494 Q2 Chemistry: General Chemistry	One of the important aspects for degradation of the life quality is the ever increasing volume and range of industrial wastes. Polymer wastes, such as automotive tire rubber, are a source of long-term environmental pollution. This paper presents an approach to simplifying the rubber waste recycling process using cryogenic temperatures. The temperature of cryogenic treatment is ranged from 77 K	Yerezhep, D., Tychengulova, A., Sokolov, D., Aldiyarov, A. A multifaceted approach for cryogenic waste tire recycling // Polymers, 2021, 13(15), 2494 DOI: 10.3390/polym13152494 https://www.scopus.com/record/display.uri?eid=2-s2.0-85111943563&origin=resultslist

			<p>to 280 K. Liquid nitrogen was used as a cryoagent for laboratory tests. Experimental and numerical studies have been carried out to determine the optimal conditions for the recycling process. Numerical studies were performed using the COMSOL Multiphysics cross-platform software. The optimal force of mechanical shock for the destruction of a tire which turned into a glassy state after cryoexposure was determined experimentally. The chemical and physical properties of the final product (crumb rubber) have been studied by scanning electron microscopy and energy dispersive X-ray spectroscopy. The analysis shows that the morphology and elemental composition of the samples remain practically unchanged, demonstrating environmental friendliness of the proposed process.</p>	
34.	3-D modelling of heat and mass transfer during	DOI: 10.2298/TSCI191107062S Q3 Energy: Renewable Energy, Sustainability and the Environment	Using numerical methods, the basic characteristics of heat and mass transfer processes in the furnace chamber of the BKZ-75 boiler of the Shakhtinskaya TPP	Safarik, P., Askarova, A., Bolegenova, S., Maximov, V., Bolegenova, S., Nugymanova, A. The 3-D modelling of heat and mass transfer during combustion of low-grade coal // Thermal Science, 2020, 24, стр. 2823–2832 DOI: 10.2298/TSCI191107062S

	combustion of low-grade coal		<p>(Kazakhstan) were studied during a forced partial stop of the supply of coal dust through the burners. Two modes of fuel supply were studied; a direct-flow method of supplying air mixtures, when two direct-flow burners are working and two are in emergency mode and vortex method of supplying air mixtures - two vortex burners with a swirl angle of the air mixture flow and their inclination the center of symmetry of the boiler by 30° and two are in emergency mode. The computational experiments allowed to obtain the distributions of the total velocity vector, temperature fields, concentration fields of CO, NO₂ throughout the entire volume of the combustion chamber and conduct a comparative analysis for the two investigated emergency mode (direct-flow and vortex). Based on the results, it can be concluded that in the case of a forced partial stop of the supply of coal dust, the use of the vortex method of supplying air mixtures improves heat and</p>	<p>https://www.scopus.com/record/display.uri?eid=2-s2.0-85089245543&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>
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			mass transfer processes and allows minimizing emissions of harmful substances.	
35.	Minimization of toxic emissions during burning low-grade fuel at Kazakhstan thermal power plant	DOI: 10.14311/AP.2020.60.0206 Q2 Engineering: General Engineering	This paper presents new results of computational experiments on the implementation of Overfire Air (OFA) technologies using an example of a combustion chamber of the BKZ-75 boiler of the Shakhtinskaya power plant (Shakhtinsk, Kazakhstan) burning high-ash Karaganda coal. The effect of mass air flow through special nozzles located above the burner level on the flow aerodynamics, temperature fields, concentration fields of carbon monoxide CO and nitrogen NO over the entire volume of the combustion chamber was studied. The studied characteristics were compared for various percentages of supplying additional air through OFA injectors: OFA is 0 % (basic version), 10 % and 18 %. It was shown that the installation of OFA injectors leads to a change in the field of the total velocity vector, temperature, and concentrations	Askarova, A., Šafařík, P., Nugymanova, A., Bolegenova, S., Maximov, V., Bolegenova, S., Polytechnica, A. Minimization of toxic emissions during burning low-grade fuel at Kazakhstan thermal power plant // Acta Polytechnica, 2020, 60(3), стр. 206–213 DOI: 10.14311/AP.2020.60.0206 https://www.scopus.com/record/display.uri?eid=2-s2.0-85090715182&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>of carbon oxides and nitrogen. An increase in the percentage of air supplied through OFA injectors to 18 % leads to a decrease in the concentrations of carbon monoxide CO by about 36 % and nitrogen oxide NO by 25 % compared with the base case. The obtained results will optimize the process of burning pulverized fuel in the combustion chamber of the BKZ-75 boiler, increase the efficiency of fuel burnout, reduce harmful emissions and introduce OFA technology at other coal-burning thermal power plants.</p>	
36.	Reduction harmful emissions at the pulverized fuel combustion in the furnace chamber	DOI: 10.34049/bcc.52.C.0048 Q4 Chemistry: General Chemistry	<p>The basic characteristics of heat and mass transfer processes in the furnace chamber of the BKZ-75 boiler of the Shakhtinskaya thermal power plant (Kazakhstan) using numerical methods were studied during a forced partial stop of the supply of coal dust through burners. Two methods were studied: 1– a direct-flow method of supplying air mixtures: two direct-flow burners are working and two are in emergency mode; 2 – vortex</p>	<p>Askarova, A.S., Safarik, P., Bolegenova, S.A., Maksimov V.Yu., Bolegenova, S.A., Nugymanova, A.O., Manatbayev, R.K., Shortanbayeva, Zh.K. Reduction harmful emissions at the pulverized fuel combustion in the furnace chamber // Bulgarian Chemical Communications, 2020, 52, стр. 26–31 DOI: 10.34049/bcc.52.C.0048 https://www.scopus.com/record/display.uri?eid=2-s2.0-85101771371&origin=resultslist</p>

			<p>method of supplying air mixtures: two vortex burners with a swirl angle of the air mixture flow and their inclination to the center of symmetry of the boiler by 30 degrees and two are in emergency mode. The numerical experiments allowed to obtain the temperature fields and concentration of carbon monoxides CO, nitrogen dioxide NO₂ throughout the entire volume of the combustion chamber and conduct a comparative analysis for the two investigated emergency mode. It can be concluded that in the case of a forced partial stop of the supply of coal dust, the use of the vortex method of supplying air mixtures improves heat and mass transfer processes and allows minimizing emissions of harmful substances.</p>	
37.	Computer technologies of 3d modeling by combustion processes to create	DOI: 10.3390/en14051236 Q3 Energy: Fuel Technology	Using numerical methods, studies have been carried out to determine the effect of the introduction of the technology of two-stage combustion of high-ash Karaganda coal on the main characteristics of heat and	Askarova, A., Bolegenova, S., Maximov, V., Bolegenova, S., Askarov, N., Nugymanova, A. Computer technologies of 3d modeling by combustion processes to create effective methods of burning solid fuel and reduce harmful dust and gas emissions into the atmosphere // Energies, 2021, 14(5), 1236 DOI: 10.3390/en14051236

	<p>effective methods of burning solid fuel and reduce harmful dust and gas emissions into the atmosphere</p>		<p>mass transfer processes in the furnace of the BKZ-75 boiler at Shakhtinskaya TPP (Kazakhstan). Various regimes of supplying additional air into the combustion space, the volume of which varied from 0% (traditional basic version) to 30% of the total volume of air required for fuel combustion, have been investigated using 3D computer modeling methods. The performed computational experiments made it possible to obtain the distributions of the total velocity vector, temperature fields, concentration fields of carbon monoxide CO and nitrogen dioxide NO₂ over the entire volume of the furnace and at the outlet from it. The introduction of the two-stage combustion technology made it possible to optimize the combustion of high-ash coal, since in this case there is an increase in the temperature in the torch core and a decrease in it at the outlet from the furnace, which has a significant effect on the chemical processes of the formation of combustion</p>	<p>https://www.scopus.com/record/display.uri?eid=2-s2.0-85106281778&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>
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			<p>products. Based on the results obtained, it can be concluded that an increase in the percentage of air supplied through additional injectors to 18% leads to a decrease in the concentrations of carbon monoxide CO by about 36%, and nitrogen dioxide NO₂ by 25% compared to the base case. A further increase in the volume of additional air leads to a deterioration in these indicators. The results obtained will make it possible to optimize the combustion of low-grade fuel in the furnace of the BKZ-75 boiler, increase the efficiency of fuel burnout, reduce harmful emissions into the atmosphere, and introduce a two-stage combustion technology at other coal-fired TPPs.</p>	
38.	3D simulation of heat and mass transfer for testing of “clean energy” production technologies	DOI: 10.1134/S0869864321020104 Q3 Energy Engineering and Power Technology	The paper describes a study of the influence of Overfire Air (OFA) technology on heat and mass transfer parameters for a furnace chamber in the BKZ-75 boiler at the Shakhtinsk power plant (Kazakhstan); this plant is fueled with Karaganda high-ash coal. The computer simulation methods were applied for	Messerle, V.E., Askarova, A.S., Bolegenova, S.A., Maximov, V.Y., Bolegenova, S.A., Nugymanova, A.O. 3D simulation of heat and mass transfer for testing of “clean energy” production technologies // Thermophysics and Aeromechanics, 2021, 28(2), стр. 271–280 DOI: 10.1134/S0869864321020104 https://www.scopus.com/record/display.uri?eid=2-s2.0-85110543899&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>studying different air supply regimes through the air injectors operating in OFA design with different contributions: 0 (reference variant), 5, 10, 15, 18, and 20 %. The computer simulation of in furnace processes offers the distribution for total velocity vector, temperature field, NO₂ concentration field for the entire furnace and the exit zone. The study demonstrated that the operation with air injection at 18 % of OFA is optimal for combustion of high-ash coal. This operation mode offers a higher temperature at the flame core and a gradual temperature reduction at the chamber outlet; the latter feature is significant for chemistry of combustion products. The boiler under this operation mode offers a reduction of nitrogen oxide NO₂ emissions from the furnace.</p>	
39.	Using Plasma Activation to Optimize the Combustion Process and Minimize	DOI: 10.1002/ceat.202100169 Q3 Chemical Engineering: General Chemical Engineering	The possibility of introducing plasma ignition of fuel in combustion chambers of power boilers was investigated by using 3D computer modeling methods. Computational experiments were carried out on	Askarova, A., Safarik, P., Bolegenova, S., Nugymanova, A., Maximov, V., Askarov, N., Bolegenova, S. Using Plasma Activation to Optimize the Combustion Process and Minimize Harmful Emissions // Chemical Engineering and Technology, 2021, 44(11), стр. 1970–1977 DOI: 10.1002/ceat.202100169

	Harmful Emissions		operating boilers, and a comparison of the characteristics of the combustion process for traditional fuel combustion and its thermochemical variant was carried out. Plasma technology allows the concentration of carbon and nitrogen oxides at the outlet of the furnace to be reduced. The results obtained showed the efficiency of thermochemical plasma activation of fuel and the possibility of its application in real heat and power facilities to optimize combustion processes and minimize harmful emissions.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85116292780&origin=resultslist
40.	Gasification of biomass in a plasma gasifier	DOI: 10.31025/2611-4135/2020.13989 Q4 Environmental Science: Environmental Engineering	This paper presents the thermodynamic analysis and experimental results on the plasma gasification of biomass using the example of wood waste. Thermodynamic computations revealed that synthesis gas can be produced from wood waste for utilization in the heat-and-power engineering, metallurgy and chemical industries. The air gasification of wood waste produces a synthesis gas yield	Messerle, V., Ustimenko, A., Lavrichshev, O., Slavinskaya, N., Sitdikov, Z. Gasification of biomass in a plasma gasifier // Detritus, 2020, 12, crp. 62–72 DOI: 10.31025/2611-4135/2020.13989 https://www.scopus.com/record/display.uri?eid=2-s2.0-85092505027&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>of 71.6% (CO-41.9% and H₂-29.7%). Experiments on the plasma gasification of wood waste were conducted in an experimental setup composed of a plasma gasifier with 50 kg/h nominal productivity and a DC plasmatron with 70 kW nominal power. Based on gas analysis, the exit gas of the plasma setup exhibited the following composition, vol.%: CO-42.0, H₂-25.1, and N₂-32.9. The measured temperature in the bottom of the plasma gasifier was 1,560 K. The discrepancy between the experimental and calculated yield of synthesis gas was not more than 7%. Harmful impurities were not observed in the gases or the condensed products generated from the plasma gasification of wood waste.</p>	
41.	Application of Organic Fuel Additives to Enhance Coal Combustion Efficiency	DOI: 10.1134/S0040601520020044 Q3 Energy: Energy Engineering and Power Technology	The results from numerical and experimental investigations into the influence of organic fuel additives (OFAs) on the efficiency of combusting high-ash Ekibastuz coal are presented. Technology and a special combustion chamber	Messerle, V.E., Paskalov, G., Umbetkaliyev, K.A., Ustimenko, A.B. Application of Organic Fuel Additives to Enhance Coal Combustion Efficiency // Thermal Engineering, 2020, 67(2), стр. 115–121 DOI: 10.1134/S0040601520020044 https://www.scopus.com/sourceid/22092?origin=resultslist

			<p>equipped with a plasma-assisted startup system are proposed. The thermodynamic and kinetic parameters of cocombustion of coal with OFA are numerically analyzed, as a result of which the optimum process temperatures, air-to-coal mass consumption ratios, and combustion chamber geometrical parameters have been selected. Thermodynamic analyses of the coal combustion process have shown that 7 kg of air is required to burn 1 kg of coal. A tendency toward increasing the concentrations of CO₂ and H₂O and, accordingly, toward decreasing the concentrations of NO, CO, and O₂ in the coal combustion products in using OFA has been revealed. The kinetic analysis results have shown that the coal combustion process with a consumption rate of 10 kg/h is fully completed in a combustion chamber 0.2 m in diameter and 0.9 m in height. A series of experiments on cocombustion of Ekibastuz coal with OFA was carried out. The investigation results made it</p>	
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			<p>possible to evaluate the effectiveness of Omstar-DX1 and Open Flame OFAs, which are prepared as mixtures of light ethers. Comparative experiments of coal combustion with and without OFAs in different concentrations (0–5 cm³ per kg of coal) have shown that the OFAs increase the flame temperature in the combustion chamber's initial part and decrease this temperature at the chamber's outlet. This means that the air–coal mixture takes less time to ignite and, accordingly, it burns out more rapidly. The introduction of OFAs results in a noticeably more efficient combustion of low-grade coal, in smaller emissions of CO and NO, and in an increased concentration of CO₂, which points to the more complete combustion of fuel.</p>	
42.	Modeling of Coal Ignition in Plasma-Fuel Systems with an Electric Arc Torch	DOI: 10.1109/TPS.2019.2956847 Q3 Physics and Astronomy: Nuclear and High Energy Physics	Results of numerical experiments on ignition of pulverized coal in a plasma-fuel system (PFS) are presented. PFS is designed for fuel oil-free startup of the boilers and stabilization of pulverized coal	Messerle, V.E., Ustimenko, A.B. Modeling of Coal Ignition in Plasma-Fuel Systems with an Electric Arc Torch // IEEE Transactions on Plasma Science, 2020, 48(2), стр. 343–349, 8937498 DOI: 10.1109/TPS.2019.2956847

		<p>flame and represents a pulverized coal burner equipped with plasma torch. The calculations were carried out using the PlasmaKinTherm program. It combines kinetic and thermodynamic methods for calculating the processes of motion, heating, thermochemical transformations, and ignition of the fuel mixture in the volume of the PFS. The ignition conditions of the fuel mixture had previously been determined for two operating parameters of the PFS: the electric power of the plasma torch and the ash content of coal. Also, one of the main regime parameters of the PFS providing ignition of the fuel is the concentration of coal dust in the fuel mixture. It can vary within a wide range. Therefore, conditions for fuel mixture ignition in the PFS have been investigated, depending on the concentration of coal in the fuel mixture in the range from 0.4 to 1.8 kg of coal per 1 kg of air. Calculations were performed for cylindrical PFS of 0.2 m diameter and 3 m</p>	<p>https://www.scopus.com/record/display.uri?eid=2-s2.0-85081063122&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>
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			of length at fixed consumption of coal (1000 kg/h), the plasma torch power (60 kW), and three values of coal ash content (20%, 40%, and 70%). Nontrivial regularities of the process of plasma thermochemical preparation of fuel for burning were revealed.	
43.	Recycling of Organic Waste in a Plasma Reactor	DOI: 10.1007/s10891-020-02199-0 Q3 Engineering: General Engineering	Thermodynamic calculations and experiments on plasma gasification of wood waste have been conducted. On the basis of a verified TERRA universal thermodynamic-calculation program, the authors have conducted an experiment on plasma recycling of agricultural waste. No detrimental impurities were found in the products of plasma recycling.	Messerle, V.E., Mossé, A.L., Ustimenko, A.B., Slavinskaya, N.A., Sitdikov, Z.Z. Recycling of Organic Waste in a Plasma Reactor // Journal of Engineering Physics and Thermophysics, 2020, 93(4), сrp. 987–997 DOI: 10.1007/s10891-020-02199-0 https://www.scopus.com/record/display.uri?eid=2-s2.0-85089870087&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1
44.	Plasma-fuel systems for clean coal technologies	DOI: 10.1680/jener.19.00053 Q3 Energy: General Energy	This paper presents plasma technology for pulverised-coal ignition and improving energy efficiency of power stations. Plasma-fuel systems (PFS) were developed to accomplish this technology. PFS are a combination of pulverised-coal burners with arc plasmatrons. The main idea of the technology using PFS is to replace the traditionally used fuel oil for	Messerle, V., Ustimenko, A., Lavrichshev, O. Plasma-fuel systems for clean coal technologies // Proceedings of Institution of Civil Engineers: Energy, 2021, 174(2), сrp. 79–83 DOI: 10.1680/jener.19.00053 https://www.scopus.com/record/display.uri?eid=2-s2.0-85106663564&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>flame stabilisation and starting coal-fired boilers with the products of plasma chemically treated pulverised-coal. The coal-Air mixture is fed into the PFS where the plasmatron induces heating, devolatilisation and gasification of the coal particles and partial oxidation of the char carbon. As a result, a highly reactive two-component fuel (mixture of combustible gases and partially oxidised char particles) is formed at the exit of the PFS. At the entry to the furnace, this highly reactive two-component fuel is easily ignited. PFS increase the efficiency of coal ignition and combustion, eliminate fuel oil expenditure for boiler start-up and flame stabilisation and decrease unburned carbon, nitrogen oxides (NO_x), sulfur oxides (SO_x) and vanadium (V) oxide emissions. PFS have been tested at 30 coal-fired power stations and steam coals of all ranks were used. The volatile content of steam coals varied from 4 to 50%; ash from 15 to</p>	
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			56%; and heat of combustion from 6700 to 25 000 kJ/kg.	
45.	Changing Diffusion–Convection Modes in Ternary Mixtures with a Diluent Gas	DOI:10.1134/S0040579520020086 Q3 Chemical Engineering: General Chemical Engineering	The characteristic features of the diffusion of helium and nitrous oxide diluted by propane to the same extent are experimentally studied at different pressures and concentrations of the diluent gas in the mixture. It is found that, at a certain pressure, convection currents appear in the system which intensify the partial mass transfer, which uncommon for diffusion. An increase in pressure intensifies the mixing of the components of the mixture. An increase in the concentration of the diluent gas in the mixture leads to the stabilization of convection modes. Solving diffusion equations shows that, in systems with a ballast gas, conditions for the nonlinear distribution of the concentrations of the components of the mixture along the length of the channel are implemented which can lead to the appearance of an extremum of the density of the mixture (i.e., inversion of the	Kosov, V.N., Fedorenko, O.V., Asembaeva, M.K., Mukamedenkyzy, V. Changing Diffusion–Convection Modes in Ternary Mixtures with a Diluent Gas // Theoretical Foundations of Chemical Engineering, 2020, 54(2), crp. 289–296 DOI:10.1134/S0040579520020086 https://www.scopus.com/record/display.uri?eid=2-s2.0-85084427996&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			density gradient of the mixture), which induces the appearance of convection currents. The stability of the mechanical equilibrium of the ternary mixture in a vertical cylindrical channel under the action of gravity and at the predefined concentration gradients of the components is numerically studied. The boundary of the diffusion-convection kinetic transition is determined. The experimental and numerical results are compared in the coordinates of the Rayleigh number and pressure.	
46.	Features of diffusion and convective mixing in mixtures containing hydrocarbons	DOI: 10.1088/1742-6596/1565/1/012063 Q4 Physics and Astronomy: General Physics and Astronomy	Diffusion mixing in mixtures of $C_3H_8 + CO_2-N_2O$, $Ne + C_3H_8-N_2O + C_3H_8$, $N_2O + He-C_3H_8 + CH_4$ at different pressures has been studied experimentally. It has been found that at a certain pressure in the mixture there are convective flows distorting the expected diffusion transfer. The transition parameters from diffusion to convective mixing type can be determined in terms of stability theory. The numerical results are compared with experimental data.	Moldabekova, M.S., Asembaeva, M.K., Krasikov, S.A., Nurtay, G.F. Features of diffusion and convective mixing in mixtures containing hydrocarbons // Journal of Physics: Conference Series, 2020, 1565(1), 012063 DOI: 10.1088/1742-6596/1565/1/012063 https://www.scopus.com/record/display.uri?eid=2-s2.0-85090230126&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

47.	Intensification of the Separation of Isothermal Ternary Gas Mixtures Containing Carbon Dioxide	DOI: 10.1002/ceat.202100241 Q3 Chemical Engineering: General Chemical Engineering	The possibility of intensifying the separation of isothermal ternary gas mixtures containing carbon dioxide was studied experimentally. It was shown that the preferential transfer of carbon dioxide requires the system to be initially diffusively unstable, and the interdiffusion coefficients of mixing components can either differ significantly from each other or be close in value. A linear analysis of the stability of isothermal ternary gas mixtures containing carbon dioxide for a flat vertical channel and a cylindrical channel of finite height was performed. Comparison of the results of the numerical study with experimental data showed qualitative coherency.	Kossov, V., Fedorenko, O., Asembaeva, M., Mukamedenkyzy, V., Moldabekova, M. Intensification of the Separation of Isothermal Ternary Gas Mixtures Containing Carbon Dioxide // Chemical Engineering and Technology, 2021, 44(11), стр. 2034–2040 DOI: 10.1002/ceat.202100241 https://www.scopus.com/record/display.uri?eid=2-s2.0-85115374585&origin=resultslist&featureToggle=FEATURE_VIEW_PDF:1
48.	Study of stress-strain state billets when rolling in a continuous mill of hot-rolled thin stripes using	Q3 Physics and Astronomy: Condensed Matter Physics	The article proposes a new design of a continuous mill. To study the stress-strain state during rolling of thin slabs on the proposed mill, a three-dimensional geometric and simulation model of the rolling process was developed using MSC SUPER FORGE. Based on the obtained results of	Kaliyev, Y.B., Baizhumanov, K.D., Tursymbekova, Z.Z., Zhumanov M.A., Smailova G.A., Azilkiyasheva, M.M., Zhauyt, A. Study of stress-strain state billets when rolling in a continuous mill of hot-rolled thin stripes using msc super forge // Metalurgija, 2021, 60(1-2), стр. 159–161 https://www.scopus.com/record/display.uri?eid=2-s2.0-85096193410&origin=resultslist&featureToggle=FEATURE_VIEW_PDF:1

	msc super forge		numerical modeling, the distributions of equivalent strains in a thin slab when rolling in 1 mill stand, the distribution of equivalent stresses in a thin slab when rolling in 1 mill stand, the distribution of the temperature field in a thin slab when rolling in 1 mill stand.	
49.	Numerical simulations on static Vertical Axis Wind Turbine blade icing	DOI: 10.1016/j.renene.2021.02.023 Q1 Energy: Renewable Energy, Sustainability and the Environment	During the last decade, there was an increased interest in wind turbine icing. Most of the icing studies are related to horizontal axis wind turbine icing (HAWT). Vertical axis wind turbine (VAWT) icing is seldomly reported in the literature. Compared to the HAWT blade VAWT blade operates under various angles of attack. Therefore, ice accretion shapes on static VAWT blade must be considered under different angles of attack. In the present study, a novel approach to predict ice accretion shapes on VAWT is described. Ice accretion shapes are obtained at a range of angles of attack between -25° and 25° using FENSAP-ICE which is the state-of-art icing simulation	Manatbayev, R., Baizhuma, Z., Bolegenova, S., Georgiev, A. Numerical simulations on static Vertical Axis Wind Turbine blade icing // Renewable Energy, 2021, 170, стр. 997–1007 DOI: 10.1016/j.renene.2021.02.023 https://www.scopus.com/record/display.uri?eid=2-s2.0-85100894785&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>tool. Moving reference frame (MRF) was used to consider rotating effect on droplet field. The present method helped to draw the following conclusions. Firstly, the whole leading edge is covered by ice. Secondly, in rime ice conditions smooth ice shape is obtained, which does not significantly affect aerodynamic performance. Whereas in glaze ice conditions bumpy ice shapes causing massive flow separation and lift force degradation. Finally, iced VAWT loses up to 60% of power performance due to rime ice conditions. In glaze ice conditions VAWT is unable to produce power.</p>	
50.	Numerical method to predict ice accretion shapes and performance penalties for rotating vertical axis wind turbines under icing conditions	DOI: 10.1016/j.jweia.2021.104708 Q1 Energy: Renewable Energy, Sustainability and the Environment	<p>This paper proposes a numerical method to predict the ice accretion shapes and aerodynamic performance of rotating vertical axis wind turbine (VAWTs) under icing conditions. A multiple reference frame (MRF) and sliding mesh technique (SMT) are combined to efficiently reflect the unsteady icing effects on rotating wind turbines. The SMT calculates</p>	<p>Baizhuma, Z., Kim, T., Son, C. Numerical method to predict ice accretion shapes and performance penalties for rotating vertical axis wind turbines under icing conditions // Journal of Wind Engineering and Industrial Aerodynamics, 2021, 216, 104708 DOI: 10.1016/j.jweia.2021.104708 https://www.scopus.com/record/display.uri?eid=2-s2.0-85111317123&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>

			<p>the flow field considering the rotational and unsteady effects of the VAWTs. The MRF can efficiently clarify the rotational effects of the droplet field and ice accretion. Using the MRF technique, a series of icing simulations is implemented in which the ice shapes are updated at azimuth angle intervals of 36°. Using the proposed method, ice shapes in agreement with those obtained in icing wind tunnel tests can be obtained. Moreover, ice that is evenly distributed over the blade surface under glaze ice conditions can be examined instead of only the forms concentrated on the leading-edge, such as ice horns. The overall output power of an ice-covered VAWT is noted to be significantly reduced. Massive flow separation is induced owing to the increased airfoil thickness at azimuthal angles between 0° and 180°. Nevertheless, the performance of the thickened airfoil is enhanced owing to the delayed flow separation via dynamic</p>	
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			stall in azimuthal angles between 180° and 270°.	
51.	Investigation Oil Bituminous Sands - Raw Materials for Energy	Q4 Engineering: General Engineering	In Western Kazakhstan, there are huge reserves of oil Sands, containing in its composition natural bitumen, which can be used in various sectors of the economy. The widespread use of bitumen is due to their high technological, operational and economic performance. The composite materials were obtained by the reaction of lithification with modifying additives of oil-bitumen rocks with inorganic minerals at room temperature. IR-spectroscopy oil-bitumene rocks were carried. The separation of the organic part of the oil-bearing mine from the Munaily-Mola deposit of West Kazakhstan was carried out by the extraction method with the Soxlet apparatus. As a solvent, a mixture of 1: 4 alcohol-benzene is used. Three-and-four-layer filter cylinder cartridge (intravascular tube) was prepared from the filter paper without diameter of the neck diameter of the extraction nozzle. The tube was dried in a	Abdikarimov, M., Turgumbayeva, R., Sagintayeva, S., ...Bekalay, N., Adilbekov, A. Investigation Oil Bituminous Sands - Raw Materials for Energy // Journal of Engineering Science and Technology Review, 2020, (Special Issue), ctp. 196–199 https://www.scopus.com/record/display.uri?eid=2-s2.0-85114126507&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			drying oven, and on the one hand it was wrapped in cotton, and measured. The tube is filled with fiber, cotton pellets, and again measured, the difference in mass is 0.01 g. The volume of oil-bitumene rocks No. 4 in the organic part is 12,66%, and the mineral part is 87,34%. At the same time, in oil-bitumene rocks No. 5, the share of government securities in the GS - 12.47%, mineral part - 87.53%.	
52.	Intensification of combustion fuel mixture in petrolair thermal tools with ejector nozzle	DOI: 10.32014/2020.2518-170X.52 Earth and Planetary Sciences: Geotechnical Engineering and Engineering Geology	The article considers the problem of increasing the power of the air-petrol thermal tools for destruction of rocks in the extraction and processing (stabilizing) block of stone, due to the intensification of combustion of the fuel mixture in a supersonic high-temperature jet torch burner. The model of shock wave excitation process in ejector nozzle, described by the equations of preservation of mechanics of continuous environments is given. As a result, the solution to this equation found the main operating and design	Bukayeva, A.Z., Poveikin, V.V., Bektibay, B.Z., Nurymov, Y.K., Yermekov, D.K. Intensification of combustion fuel mixture in petrolair thermal tools with ejector nozzle // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences, 2020, 3(441), crp. 40–47 DOI: 10.32014/2020.2518-170X.52 https://www.scopus.com/record/display.uri?eid=2-s2.0-85090707658&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			parameters of the ejector nozzle, the parameters of the supersonic gas stream flowing from the Laval's nozzle of the burner into the cavity of the ejection nozzle, and the speed and temperature of the gas stream in the mixing chamber (combustion), the area of the output section and the diameter of the ejection of the mixing chamber, diameter and length of the free jet.	
53.	Experimental Investigation of a Free Turbulent Air Jet Outflowing from a Nozzle of Square Shape	DOI: 10.1007/s10891-020-02105-8 Q3 Engineering: General Engineering	Experimental investigation of average characteristics of flow in a turbulent free air jet issuing from a nozzle of square shape has been carried out. The investigations were carried out in the presence and absence of external acoustic effect.	Isataev, M.S., Toleuov, G., Sultan, M. Experimental Investigation of a Free Turbulent Air Jet Outflowing from a Nozzle of Square Shape // Journal of Engineering Physics and Thermophysics, 2020, 93(1), crp. 172–177 DOI: 10.1007/s10891-020-02105-8 https://www.scopus.com/record/display.uri?eid=2-s2.0-85080943198&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1
54.	Calculation of the end plates frictional resistance effect on the flat jet dynamics	DOI: 10.31489/2020NO1/85-90 Q4 Engineering: General Engineering	This article is a continuation of scientific research on the calculation of the effect of friction resistance of end plates on the aerodynamics of a flat jet. In the previous works, the resistance was calculated for a turbulent boundary layer. This paper shows the results of calculating the effect of friction resistance of end plates on the	Toleuov, G.K., Isataev, M.S., Seydulla, Zh.K., Zулbukharova, E.M., Masina, M.N. Calculation of the end plates frictional resistance effect on the flat jet dynamics // Eurasian Physical Technical Journal, 2020, 17(1), crp. 85–90 DOI: 10.31489/2020NO1/85-90 https://www.scopus.com/record/display.uri?eid=2-s2.0-85090590095&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>patterns of development of a flat free jet. A flow diagram of the jet between the end surfaces has been constructed. The resistance calculation for the laminar boundary layer has been carried out. The formula for calculation of the change in the maximum jet velocity in a first approximation has been derived. The comparison of the theoretical calculations with the experimental data has shown a good agreement.</p>	
55.	<p>Application of integrated membrane bioreactors in renewable energy industry</p>	<p>Q4 Engineering: Industrial and Manufacturing Engineering</p>	<p>Excessive use of fossil fuel results in a rapid depletion of non-renewable fossil energy resources, a rise in fuel cost and an uncontrolled emission of greenhouse gases, which causes a severe threat to the environment. This critical state has turned the awareness to explore renewable energy resources, which include water, biomass, wind and geothermal heat. Among these possibilities, biomass based fuels, i.e. biofuels, have been proposed as a substitute for conventional diesel and gasoline. The biofuels burn cleanly, thereby reducing harmful emissions,</p>	<p>Kalassov, N., Dzhonova, D., Tsibranska, I., Panyovska, S., Manatbayev, R. Application of integrated membrane bioreactors in renewable energy industry // Journal of Chemical Technology and Metallurgy, 2020, 55(2), стр. 314–323 https://www.scopus.com/record/display.uri?eid=2-s2.0-85101849917&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>

			<p>especially in the form of carbon monoxide, unburned hydrocarbon and toxic chemicals. This work aims at revealing the current state-of-the-art and the challenges in the application of integrated membrane bioreactors (MBRs) in biofuel production. This innovative technology is employed for production of biofuels in gaseous and liquid state, such as biohydrogen, bio crude oil, bioethanol and biodiesel. Great opportunities for producing combustible gas mixtures open up broad prospects for integrated systems, and the low energy intensity makes them attractive for industrial developments. Coupling of bio processes and membrane filtration allows to solve the problem of producing methane and hydrogen without emission of carbon dioxide into the atmosphere. The main advantage of a MBR system is that it can be applied using environmentally friendly technology, i.e. biotechnology based on natural processes and mechanisms of conversion of</p>	
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			substances by enzymes and microbial cultures. The waste and by-products of these processes can also serve as additional sources of raw materials, which leads to completely waste-free production.	
56.	Numerical investigation of the occurrence of a concentration-polarization layer	DOI: 10.31489/2021NO2/56-59 Q4 Engineering: General Engineering	This work describes the appearance of a concentration polarizing boundary layer on the membrane surface during the separation of the H ₂ /CO ₂ gas mixture. Concentration polarization occurs when the rejection solution accumulates near the surface of the membrane, forming a boundary layer. The inclusion of concentration polarization effects in the processing of porous walls creates additional difficulties. The boundary layer formed by concentration polarization can be considered as a type of a second porous wall with a lower permeability than the membrane. The main difficulty in modeling this situation is to determine the appropriate boundary conditions for the concentration on the wall, since the	Manatbayev, R.K., Kalassov, N.B., Amankeldi, L.B. Numerical investigation of the occurrence of a concentration-polarization layer // Eurasian Physical Technical Journal, 2021, 18(2), стр. 56–59 DOI: 10.31489/2021NO2/56-59 https://www.scopus.com/record/display.uri?eid=2-s2.0-85111095017&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>concentrations on the wall will constantly change, and the wall geometry itself may change over time due to particle deposition. To account for this effect, a numerical approach was developed, which is discussed in this work.</p>	
57.	<p>Development of a Technology of Gasflame Application of Powders to Increase Wear Resistance and Adhesion Strength</p>	<p>DOI: 10.15587/1729-4061.2021.235578 Q3 Engineering: Industrial and Manufacturing Engineering</p>	<p>Every year, the world economy suffers enormous losses due to wear and corrosion of machine parts and equipment. With targeted preventive protection against wear and tear, these losses can be avoided. Along with the coating of new parts, this includes the restoration of worn parts. An effective method is the surfacing of materials with high performance properties. The quality of hardened parts depends on the properties of deposited material, so hardening material or alloy is selected taking into account the working environment of the part and the coating method. Today there are many self-fluxing surfacing powder alloys based on nickel, copper and others, obtained by different methods. The paper discusses</p>	<p>Yermekov, D., Povetkin, V., Rutkuniene, Z., Nurmukhanova, A., Bukayeva, A. Development of a Technology of Gasflame Application of Powders to Increase Wear Resistance and Adhesion Strength // Eastern-European Journal of Enterprise Technologies, 2021, 3, стр. 14–24 DOI: 10.15587/1729-4061.2021.235578 https://www.scopus.com/record/display.uri?eid=2-s2.0-85109461965&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>

			<p>the process of studying the gas-flame application of powders to increase wear resistance and adhesion strength. Experimental studies have been carried out to determine the optimal composition of the CrB₂ master alloy introduced into the composition of the GP-Ir40 surfacing alloy. It has been found that to obtain the hardness of the deposited metal in the range of 450–600 HV, it is necessary to introduce CrB₂ into the coating composition, within 10 % of the total mass. Thus, the strength of the alloy is increased by more than 54.41 HV. Tests for corrosion resistance in aggressive environments of hydrogen sulfide H₂S, sulfuric acid H₂SO₄ were carried out. The wear resistance of ground pumps was evaluated, and the service life of wear-resistant ground pump parts made of the IChH28N2 alloy was determined. The new developed self-fluxing surfacing powder material based on iron with a hardening additive will be used to restore machine and</p>	
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			equipment parts operating under conditions of abrasive wear, corrosion and elevated temperatures or corrosive environments Copyright	
58.	Parameters of heat treatment of coal to obtain combustible volatile substances	DOI: 10.1016/j.energy.2021.120088 Q1 Engineering: Civil and Structural Engineering	The article discusses the theoretical and practical foundations of the study of the possibility of obtaining volatile combustible substances released during special heat treatment of coal, with the aim of replacing ignition fuel oil at thermal power plants. The results of an experimental study of the coals of the Saryadyr field of three Kazakhstan deposits with the aim of obtaining volatile combustible substances, as well as the possibility of using these combustible substances as starting fuel, are presented. The results of calculating the heat of combustion of the gas obtained from the presented coal samples at different heating temperatures showed that with an increase in the heating temperature, the heat of combustion of combustible gases obtained from coal samples also increases. For all	Mergalimova, A., Ongar, B., Georgiev, A., ...Abitaeva, R., Bissenbayev, P. Parameters of heat treatment of coal to obtain combustible volatile substances // Energy, 2021, 224, 120088 DOI: 10.1016/j.energy.2021.120088 https://www.scopus.com/record/display.uri?eid=2-s2.0-85101809011&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1

			<p>the coal samples under consideration, the maximum value of the heat of combustion is traced at a heating temperature of 600 °C. The greatest value is observed for the coal of the Shubarkul deposit - 22.1 MJ/m³, and the minimum value for the brown coal of the Saryadyr deposit is 13.5 MJ/m³. According to the results of experimental studies, we can conclude that of the three presented coals for producing combustible gas, the most suitable are the coals of the Shubarkul and Maikuben deposits. For use in the boiler unit as a starting fuel, it is sufficient to heat coal to temperatures of 350–450 °C.</p>	
59.	Fractal-structural analysis of convection heat transfer in a turbulent medium	DOI: 10.31489/2020NO2/61-68 Q4 Engineering: General Engineering	<p>The features of convective heat transfer of bodies in a turbulent environment are considered. The results of experimental research by one of the authors are discussed. Experimental data show that the heat transfer of a spherical body is affected by natural convection, the thermo-physical properties of the medium, the tightness of the flow, the turbulent flow regime,</p>	<p>Turmukhambetov, A.Zh., Aitmanova, K.A., Otegenova, S.B. Fractal-structural analysis of convection heat transfer in a turbulent medium // Eurasian Physical Technical Journal, 2020, 17(2), стр. 61–68 DOI: 10.31489/2020NO2/61-68 https://www.scopus.com/record/display.uri?eid=2-s2.0-85100316219&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>

			<p>etc. Due to these factors, the formula for calculating convective heat transfer, which includes many experimental constants, becomes cumbersome and inconvenient for practical application. The paper presents the results of applying fractal-structural analysis methods to describe experimental data on convective heat exchange of badly streamlined (cylinder and sphere) bodies in a channel. Quantitative relations are obtained that link the intensity of turbulent heat transfer with the criteria for the degree of self-organization.</p>	
60.	<p>Radiation modification of BaCe_{0.85}Nd_{0.15}O_{3-δ}</p>	<p>Q4 Chemistry: General Chemistry</p>	<p>The effect of irradiation with electrons and ions of inert gases (Ne, Ar, Kr) and oxygen of various energies on the structure, surface state and gaseous components in BaCe_{0.85}Nd_{0.15}O_{3-δ} has been studied. It was shown that electron irradiation of BaCe_{0.85}Nd_{0.15}O_{3-δ} results in smoothing-out of the irradiated surface relief, while electron irradiation of BaCeO₃ led to formation of a fine</p>	<p>Khromushin, I.V., Yermolaev, Y.V., Kasmamytov, N.K., ...Tusseyev, T., Stanbay, L.A. Radiation modification of BaCe_{0.85}Nd_{0.15}O_{3-δ} // Bulgarian Chemical Communications, 2020, 51, crp. 49–54 https://www.scopus.com/record/display.uri?eid=2-s2.0-85096041556&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>

			<p>pyramidal (needle-shaped) structure on the irradiated surface. It was noted that in case of $\text{BaCe}_{0.85}\text{Nd}_{0.15}\text{O}_{3-\delta}$ irradiation with high-energy inert gas ions, solid-phase transformations occurred on the surface of $\text{BaCe}_{0.85}\text{Nd}_{0.15}\text{O}_{3-\delta}$. The conclusion was made about the mechanism of the influence of irradiation with high and low energy heavy ions of inert gases on the state of the gaseous components in $\text{BaCe}_{0.85}\text{Nd}_{0.15}\text{O}_{3-\delta}$, based on the features of defects formation under irradiation with the ions of different energies.</p>	
61.	<p>Kinetics of radiation-stimulated processes on the surface of oxide materials</p>	<p>DOI: 10.29317/EJPFM.2020040107 Q4 Physics and Astronomy: Radiation</p>	<p>The analysis of the experimental data shows that the processes of gas adsorption and radiation defects accumulation in metal oxides correlate with each other and most likely can be described in terms of equivalent kinetic equations. Given this circumstance, the kinetics of accumulation of radiation defects in oxides of different metals was analyzed. The obtained equations were used to</p>	<p>Tusseyev, T. Kinetics of radiation-stimulated processes on the surface of oxide materials // Eurasian Journal of Physics and Functional Materials, 2020, 4(1), стр. 61–66 DOI: 10.29317/EJPFM.2020040107 https://www.scopus.com/record/display.uri?eid=2-s2.0-85102791648&origin=resultslist&featureToggles=FEATURE_VIEW_PDF:1</p>

			<p>analyze: a) the kinetics of accumulation of radiation defects in different oxide compounds; b) the data on the destruction of radiation-induced defects in the atmosphere of different gases, and on the kinetics of absorption by oxides of oxygen, hydrogen, and carbon dioxide molecules. The results of such analysis are systematized and are given in the form of a table. The following conclusions were made: 1. The quantum yield of radiation defects increases monotonically with growth of the temperature of processing, tending to a certain limit value. 2. The constant of destruction of radicals from ionizing radiation increases as well. 3. The ratio of the number of surface and bulk defects in different oxides can be arranged in the following series: silicon oxide > beryllium oxide > aluminum oxide. Thus, the most optimal (convenient) material for creating absorbing systems by energy intensity is silicon dioxide, and by adsorption efficiency is beryllium oxide.</p>	
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Кафедра физики твердого тела и нелинейной физики

62.	Creating a virtual device for processing the results of sorption measurements in the study of zinc oxide nanorods	DOI: 10.15826/CHIMTECH.2020.7.4.03 (IF= 0.128; Q4 in Chemistry, Physical)	Abstract The work is devoted to the creation of a virtual device (computer program) for processing the results of sorption analysis of nanomaterials, including for estimating the size of nanoparticles based on the specific surface area. The obtained evaluation results were compared with the scanning electron microscopy data. Photocatalytically active zinc oxide samples were chosen as the object of the study.	<i>E. V. Maraeva, N. V. Permiakov, Y. Y. Kedruk, L. V. Gritsenko, Kh. A. Abdullin</i> Creating a virtual device for processing the results of sorption measurements in the study of zinc oxide nanorods // <u>Chimica Techno Acta.</u> - 2020 - Том 7, Выпуск 4, Страницы 154 – 158 DOI: 10.15826/CHIMTECH.2020.7.4.03
63.	<u>Morphological, Structural, and Optical Properties of Silicon Nanostructures Formed in a Solution Containing Hydrogen Hexafluorosilicate H₂(SiF₆)</u>	DOI: 10.1134/S0030400X20090234 (IF= 0.283; Q3 in Chemistry, Physical)	Abstract Photoluminescent boron-doped (100)-oriented porous silicon fabricated on a p-type silicon substrate by electrochemical etching in a solution containing fluorosilicic acid and ethanol is studied. The morphological, structural, and optical properties of silicon nanostructures obtained in solutions containing H ₂ (SiF ₆) and ethanol are analyzed in comparison with the corresponding characteristics	Zhumatova S.A., Manakov S.M., Sagidolda Y., Darmenkulova M.B., Azamat R.M., Alpysbaeva B.Y., Dikhanbaev K.K. <u>Morphological, Structural, and Optical Properties of Silicon Nanostructures Formed in a Solution Containing Hydrogen Hexafluorosilicate H₂(SiF₆)</u> 1 September 2020 - Том 128, Выпуск 9, Страницы 1487 – 1491 DOI: 10.1134/S0030400X20090234

			<p>of samples formed in solutions of HF and ethanol. The morphological, structural, and optical properties were studied using scanning probe microscopy and spectrophotometry. It is shown that the porous silicon samples formed in solutions containing $H_2(SiF_6)$ and ethanol have better optical properties, in particular, they exhibit more intense photoluminescence than the samples obtained in HF-ethanol solutions.</p>	
64.	<p><u>Physical processes during the formation of silicon-lithium p-i-n structures using double-sided diffusion and drift methods</u></p>	<p>DOI: 10.3390/ma14185174 (IF= 0.682; Q2 in Chemistry, Physical)</p>	<p>ABSTRACT In this paper, we described a method of double-sided diffusion and drift of lithium-ions into monocrystalline silicon for the formation of the large-sized, p-i-n structured Si(Li) radiation detectors. The p-i-n structure is a p-n junction with a doped region, where the “i-region” is between the n and the p layers. A well-defined i-region is usually associated with p or n layers with high resistivities. The p-i-n structure is mostly used in diodes and in some types of semiconductor</p>	<p>Saymbetov A., Muminov R., Japashov N., Toshmurodov Y., Nurgaliyev M., Koshkarbay N., Kuttybay N., Zholamanov B., Jing Z. <u>Physical processes during the formation of silicon-lithium p-i-n structures using double-sided diffusion and drift methods</u> September 2021 - Том 14, Выпуск 18 DOI: 10.3390/ma14185174</p>

			<p>radiation detectors. The uniqueness of this method is that, in this method, the processes of diffusion and drift of lithium-ions, which are the main processes in the formation of Si(Li) p-i-n structures, are produced from both flat sides of cylindrical-shaped monocrystalline silicon, at optimal temperature ($T = 420\text{ }^{\circ}\text{C}$) conditions of diffusion, and subsequently, with synchronous supply of temperature (from 55 to 100 $^{\circ}\text{C}$) and reverse bias voltage (from 70 to 300 V) during drift of lithium-ions into silicon.</p> <p>Thus, shortening the manufacturing time of the detector and providing a more uniform distribution of lithium-ions in the crystal volume.</p> <p>Since, at present, the development of manufacturing of large-sized Si(Li) detectors is hindered due to difficulties in obtaining a uniformly compensated large area and time-consuming manufacturing process, the proposed method may open up new possibilities</p>	
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			in detector manufacturing. View Full-Text	
65.	Zoo-technical features of tabun horses in almaty region of Republic of Kazakhstan	DOI: 10.3844/ajavsp.2021.15.22 (IF= 0.174; Q3 in Chemistry, Physical)		Assilbekov S., Iskhan K., Japashov N., Orynassarova A. Zoo-technical features of tabun horses in almaty region of Republic of Kazakhstan 2021 - Том 16, Выпуск 1, Страницы 15 – 22 DOI: 10.3844/ajavsp.2021.15.22
66.	Optimization technology of large-size Si(Li) p-i-n structures for X-ray detectors	DOI: 10.34049/bcc.52.1.4777 (IF = 0.179; Q4 in Chemistry, Physical)	ABSTRACT In this work, the features of manufacturing and investigating the electrophysical characteristics of Si(Li) p-i-n structures for detectors with a big volume of working area were considered. The technology of manufacturing of bigarea (up to 110 mm) semiconductor detector structures with thickness of sensitive area up to 10 mm, from lowresistance silicon grown by the Czochralski process and with high-resistance silicon obtained by the floating zone melting method was developed. The I-V, C-V and noise vs voltage dependences of detectors produced from these crystals were compared. Moreover, the	Muminov R.A., Radzhapov S.A., Saymbetov A.K., Manatbayev R.K., Toshmurodov Yo.K., Japashov N.M., Kuttybay N.B., Georgiev A.G. Optimization technology of large-size Si(Li) p-i-n structures for X-ray detectors 2020- Том 52, Выпуск 1, Страницы 5 – 8 DOI: 10.34049/bcc.52.1.4777

			<p>methods of double-sided diffusion and drift of lithium ions were applied to these crystals. Also, the methods of providing highly uniform compensated regions of detectors were considered and methods for laying uniform effective ohmic contacts on a big area of the structure were developed</p>	
67.	High-school students' cognitive responses to counterintuitive physics problems	DOI: 10.1088/1361-6552/ab4df9 (IF= 0.343; Q3 in Chemistry, Physical)	<p>ABSTRACT</p> <p>Student cognition in response to intuitive and counterintuitive stimuli in the school science curriculum is not well understood. To address this issue, this study examines high school students' cognitive responses to three counterintuitive physics problems. Our analysis reveals that student success in arriving at counter-intuitive physical responses is related to the depth of their interpretation of problem statements. When students were able to see the deep structure of a problem (i.e. recognize underlying physical principles and concepts applicable to a problem situation), they were</p>	<p>Nuri Balta, Nursultan Japasho, Mustafa Abdulkakioglu and Alandeom W Oliveira High-school students' cognitive responses to counterintuitive physics problems 2020 - Том 55, Выпуск 1 DOI: 10.1088/1361-6552/ab4df9</p>

			<p>more likely to arrive at the scientifically accepted response, despite its counter-intuitive nature. Our findings suggest that students' difficulties in solving counterintuitive problems can be due to the emergence of a superficial focus when reading problem statements. They also raise the possibility of student development of disciplinary intuition based on accepted scientific knowledge ('physics intuition').</p>	
68.	<p>Application of additional leveling drift process to improve the electrophysical parameters of large sized Si (Li) p-i-n structures</p>	<p>DOI: 10.21272/jnep.12(1).01006 (IF= 0.225; Q3 in Chemistry, Physical)</p>	<p>ABSTRACT</p> <p>The development of large sized Si (Li) detectors (with a sensitive region diameter more than 110 mm), with high energy and positional resolutions, signal linearity over a wide energy range, for alpha, beta and gamma particles is still a rather difficult technological task. This work proposes a technology to improve manufacturing procedure of p-i-n structured Si(Li) detectors. We consider a method of</p>	<p>Muminov R.A., Ergashev G.J., Saymbetov A.K., Toshmurodov Y.K., Radzhapov S.A., Mansurova A.A., Japashov N.M., Svanbayev Y.A. Application of additional leveling drift process to improve the electrophysical parameters of large sized Si (Li) p-i-n structures 2020 - Выпуск 1</p> <p>DOI: 10.21272/jnep.12(1).01006</p>

			<p>additional "leveling" drift to already prepared Si (Li) detectors to reach a uniformly compensated sensitive region throughout the entire volume, and to smooth out local areas of uncompensated detector regions at a certain temperature and electric field.</p> <p>Experimentally obtained results show that conducting an additional "leveling" drift process ensures uniform distribution of lithium ions in silicon and is one of the main technological operations. The choice of the temperature-time regime of the "leveling" drift depends on the specific resistance of the initial material. Therefore, an additional "leveling" drift was carried out on detectors obtained by p-type monocrystalline silicon with high resistance (obtained by the float-zone method) and with low resistance (obtained by the Czochralski method), and their electrophysical responses were compared.</p> <p>Consequently, it was determined that for low-</p>	
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			resistance materials, "leveling" drift is more effective.	
69.	<u>Electrical properties of silicon nanowires under ammonia adsorption conditions</u>	DOI: 10.31489/2020NO1/54-58 (IF= 0.194; Q4 in Chemistry, Physical)	ABSTRACT When monitoring the environment, measurements of the concentration and composition of the gas phase of various substances are of great importance. To solve such problems, resistive-type semiconductor sensors are of interest. The proposed sensors based on silicon nanowires have several advantages: high sensitivity and possibility to work at room temperature. This in turn simplifies the design and reduces the cost of the sensors. All this indicates the relevance of the investigated gas sensor	Dikhanbayev K.K., Bondarev A.I., Ikramova S.B., Shabdan E <u>Electrical properties of silicon nanowires under ammonia adsorption conditions</u> 2020 - Том 17, Выпуск 1, Страницы 54 – 58 DOI: 10.31489/2020NO1/54-58
70.	<u>High sensitive NH₃ sensor based on electrochemically etched porous silicon</u>	DOI: 10.1080/23311916.2020.1810880 (IF= 0.312; Q2 in Chemistry, Physical)	ABSTRACT In the current study, porous silicon (por-Si) samples were fabricated by electrochemical etching at different times (20 min, 40 min, 60 min). Scanning electron microscope (SEM) images of horizontal cross-sections of the samples showed the formation of pores. The etched samples' porosity	Khaniyev, B.A., Sagidolda, Y., Dikhanbayev, K.K., Tileu, A.O., Ibraimov, M.K. <u>High sensitive NH₃ sensor based on electrochemically etched porous silicon</u> Том 7, Выпуск 11 January 2020 DOI: 10.1080/23311916.2020.1810880

			<p>was determined by the gravimetric method and amounted to 59.5%, 72.7%, 83.3%, respectively. Optical characteristics such as Raman spectra and photoluminescence (PL) spectra were obtained.</p> <p>The current-voltage and capacitance-voltage characteristics were also measured to calculate the sensitivity of the samples. The study results show that sample, which is etched for 40 minutes has a maximum response value to ammonia (NH₃) gas than others, and the sensitivity is 33.25. The results demonstrated that it is possible to develop a high sensitive sensor device based on por-Si for determining NH₃ gas in concentrations below 0.1 ppm at room temperature.</p>	
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71.	<p><u>Angular magnetic-field dependence of vortex matching in pinning lattices fabricated by focused or masked helium ion beam irradiation of superconducting YBa₂Cu₃O_{7-δ} thin films</u></p>	<p>DOI: 10.1063/10.0000863 (IF=0.356; Q3 in Chemistry, Physical)</p>	<p>ABSTRACT The angular dependence of magnetic-field commensurability effects in thin films of the cuprate high-critical-temperature superconductor YBa₂Cu₃O_{7-δ} (YBCO) with an artificial pinning landscape is investigated. Columns of point defects are fabricated by two different methods of ion irradiation — scanning the focused 30 keV ion beam in a helium ion microscope or employing the wide-field 75 keV He⁺ beam of an ion implanter through a stencil mask. Simulations of the ion-target interactions and the resulting collision cascades reveal that with both methods square arrays of defect columns with sub-μm spacings can be created. They consist of dense point-defect clusters, which act as pinning centers for Abrikosov vortices. This is verified by the measurement of commensurable peaks of the critical current and related minima of the flux-flow resistance vs magnetic field at</p>	<p>Aichner B., Mletschnig K.L., Müller B., Karrer M., Dosmailov M., Pedarnig J.D., Kleiner R., Koelle D. Lang W</p> <p><u> Angular magnetic-field dependence of vortex matching in pinning lattices fabricated by focused or masked helium ion beam irradiation of superconducting YBa₂Cu₃O_{7-δ} thin films</u></p> <p>Том 46, Выпуск 4, Страницы 331 - 3371 April 2020 DOI: 10.1063/10.0000863</p>
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			<p>the matching fields. In oblique magnetic fields, the matching features are exclusively governed by the component of the magnetic field parallel to the axes of the columnar defects, which confirms that the magnetic flux is penetrated along the defect columns. We demonstrate that the latter dominate the pinning landscape despite of the strong intrinsic pinning in thin YBCO films.</p>	
72.	<p><u>Dual-band optical imaging system-integrated patch antenna based on anisotropic fractal for earth-observation CubeSats</u></p>	<p>DOI: 10.1016/j.asej.2021.07.010 (IF= 0.505; Q1 in Chemistry, Physical)</p>	<p>ABSTRACT</p> <p>This paper presents a dual-band optical imaging system-integrated patch antenna based on an anisotropic fractal for Earth-observation CubeSats. The antenna operates at S-band frequencies. The size of the antenna is chosen to match the end face of the CubeSats. The antenna's main characteristics are studied using simulation in Computer Simulation Technology (CST) software; prototypes are developed to verify these characteristics.</p> <p>Double-sided Glass Epoxy Sheet FR-4 is used to develop the antenna prototype.</p>	<p>Meirambekuly N., Temirbayev A.A., Zhanabaev Z.Z., Karibayev B.A.Namazbayev T.A., Khaniyev B.A., Khaniyeva A.K. <u>Dual-band optical imaging system-integrated patch antenna based on anisotropic fractal for earth-observation CubeSats 2021</u> DOI: 10.1016/j.asej.2021.07.010</p>

			<p>By studying the antenna prototype, realized gain up to 4 dBi and 2.15 dBi at two resonant frequencies of the antennas with different substrate heights are obtained. Small size, low cost, dual-band, and integration with the imaging system allow achieving the entire CubeSat system's efficiency.</p>	
73.	<p><u>Scale-invariant and wave nature of the Hubble parameter</u></p>	<p>DOI : 10.31489/2021NO2/81-89 (IF= 0.194; Q4 in Chemistry, Physical)</p>	<p>Abstract The value of the global Hubble parameter corresponding to astrophysical observations was determined theoretically without using ΛCDM models. A nonlinear fractal model of the connection between the distance to the observed galaxy and its coordinate is proposed. Distance is defined as a fractal measure, the measurement scale of which, in contrast to the known fractal models, corresponds to the deviation of the desired measure itself from its fixed value (radius of zero gravity), relative to which the scale invariance is assumed. We used the dimension of our proposed specific anisotropic</p>	<p>Zhanabaev, Z.Zh., Ussipov, N.M., Khokhlov, S.A. <u>Scale-invariant and wave nature of the Hubble parameter</u> Том 18, Выпуск 2, Страницы 81 – 89 2021 DOI : 10.31489/2021NO2/81-89</p>

			fractal, which simulates the increase in the distance to the observation point. It is shown that this dimension is also the maximum dimension of the strange attractor of the phase portrait of the equation of gravitational waves and sets of galaxies from different catalogs	
74.	<u>Width of energy band gap of nanoporous semiconductor films</u>	DOI: 10.31489/2020NO2/39-44 (IF= 0.194; Q4 in Chemistry, Physical)	ABSTRACT The aim of this work is to experimentally clarify the reasons for the appearance of jumps in the current and memory of semiconductor nanoporous structures. Porous nanostructures were obtained by electrochemical etching. The current-voltage characteristics of the samples were measured for porous silicon and on thin films of a chalcogenide glassy semiconductor. The existence of jump-like switching and current hysteresis in porous silicon nanofilms under laser illumination is shown experimentally. A connection between the switching voltage values and the dependence of the band gap on the porosity of nanofilms is found. These	Zhanabaev, Z.Zh., Ikramova, S.B., Tileu, A.O., Turlykozhaeva, D.A. Width of energy band gap of nanoporous semiconductor films Том 17, Выпуск 2, Страницы 39 – 44 2020 DOI: 10.31489/2020NO2/39-44

			<p>results make it possible to construct a theory of current switching and its hysteresis based on the concepts of the theory of second-order phase transitions.</p>	
75.	<p><u>Hardware implementation of the coding algorithm based on FPGA</u></p>	<p>DOI: 10.1088/1757-899X/1047/1/012137 (iF= 0.198; Q4 in Chemistry, Physical)</p>	<p>ABSTRACT</p> <p>In this article, the efficient implementation multiplier of polynomials irreducible polynomials modulo for cryptographic encryption and decryption using FPGA is presented. For this, the Nexys 4 board based on the Artix-7 Field Programmable Gate Array (FPGA) from Xilinx was chosen. Verilog HDL is used to describe the circuit for reducing a number modulo.</p> <p>The results of a timing simulation of the device are presented in the form of time diagrams for a given 8-bit number, confirming the correct operation of the device. The developed encryption algorithm on the basis of non-positional polynomial notations is intended for software, hardware, and also software and hardware implementation.</p>	<p>Ibraimov M.K., Tynymbayev S.T., Park J., Zhexebay D.M., Alimova M.A. Hardware implementation of the coding algorithm based on FPGA Том 1047, Выпуск 111 February 2021 DOI: 10.1088/1757-899X/1047/1/012137</p>

			<p>The main hardware-implemented device in non-positional algorithm of the cryptographic transformation is a device for the multiplication of polynomials irreducible polynomials modulo, which produces routine calculations on data encryption. These mathematical operations are computationally intensive and fundamental arithmetic operations, which are intensively used in many fields such as cryptography, number theory, and finite field arithmetic.</p>	
76.	<p><u>Period bouncer cataclysmic variable EZ Lyn in quiescence</u></p>	<p>DOI: 10.3847/1538-4357/ac0e36 (IF= 2.376; Q1 in Chemistry, Physical)</p>	<p>ABSTRACT</p> <p>We report the study of the accretion disk structure of the period bouncer cataclysmic variable EZ Lyn (SDSS J080434.20+510349.2) in quiescence based on our new time-resolved photometric and spectroscopic observations and data extracted from archives. The object magnitude now is $V = 17.95(5)$, close to its brightest before the first superoutburst in 2006. We</p>	<p>Amantayeva A, Zharikov S., Page K.L., Pavlenko E., Sosnovskij A., Khokhlov S., Ibraimov M. <u>Period bouncer cataclysmic variable EZ Lyn in quiescence</u> Том 918, Выпуск 210 September 2021 DOI: 10.3847/1538-4357/ac0e36</p>

			<p>confirmed the presence of the small eclipse in the optical light curve. The spectra obtained in quiescence at different epochs look similar. However, the contribution of the disk and intensities of emission lines are strongly varied. We singled out pure accretion disk spectra and found that the Balmer decrement $H\alpha:H\beta:H\gamma:H\delta = 1.61:1.0:0.76:0.59$ is comparable with one at bright accretion disks in longer period cataclysmic variables. The decrement suggests that emission lines are excited collisionally in an optical thin part of the disk with average density and temperature of $\log N_0 = 12.5(2)$ and $T = (10-15) \times 10^3$ K. Based on the photometric data and our modeling techniques, we redetermined the mass of $M_{WD} = 0.85(1) M_{\odot}$ and the current effective temperature $T_{WD,eff} = 11,250(50)$ K of the white dwarf. The secondary has mass of $M_2 = 0.042(14) M_{\odot}$. The system inclination is $79.0^{\circ}(2)$.</p>	
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			<p>The mass accretion rate is about $\dot{M} \approx (0.3-3.0) \times 10^{-12} M_{\odot} \text{ yr}^{-1}$. The disk luminosity, together with results from light-curve modeling, suggests a low effective temperature ~ 2500 K of the continuum emitting region, where also the spiral arm pattern is hosted.</p>	
77.	<p><u>Studies of the distinct regions due to CO selective dissociation in the Aquila molecular cloud</u></p>	<p>DOI: 10.1051/0004-6361/202038632 (IF= 2.137; Q1 in Chemistry, Physical)</p>	<p>Abstract Aims. We investigate the role of selective dissociation in the process of star formation by comparing the physical parameters of protostellar-prestellar cores and the selected regions with the CO isotope distributions in photo-dissociation regions. We seek to understand whether there is a better connection between the evolutionary age of star forming regions and the effect of selective dissociation</p>	<p>Komesh T., Baan W., Esimbek J., Zhou J., Li D., Wu G., He Y., Rosli Z., Ibraimov M. <u>Studies of the distinct regions due to CO selective dissociation in the Aquila molecular cloud</u> Tom 6441 December 2020 DOI: 10.1051/0004-6361/202038632</p>

78.	<u>The device for multiplying polynomials modulo with analysis of two least significant bits of the multiplier per step</u>	DOI: 10.32014/2020.2518-170X.60 (IF= 0.323; Q3 in Chemistry, Physical)	<p>Abstract</p> <p>We consider a device for multiplying polynomials modulo where two bits of the polynomial multiplier are analyzed per multiplication step. Such a device can serve as the basic unit for building cryptosystems based on non-positional polynomial number systems, where the binary representation of the polynomial multiplicand can show a fragment of the encrypted text, and the binary representation of the polynomial multiplier can serve as a secret key. The module is a binary representation of the irreducible polynomial of these two polynomials.</p>	Kalimoldayev M., Тынymbayev S., Gnatyuk S., Ibraimov M., Magzom M. The device for multiplying polynomials modulo with analysis of two least significant bits of the multiplier per step Том 3, Выпуск 441, Страницы 102 – 1092020 DOI: 10.32014/2020.2518-170X.60
79.	<u>Design and research of the behavioral model for the modular reduction device</u>	DOI: 10.31489/2020NO1/151-156 (IF= 0.194; Q4 in Chemistry, Physical)	<p>Abstract</p> <p>A behavioral model of the modular reduction device with optimal hardware costs was designed in CAD Quartus Prime Lite Edition. An algorithm of operation is implemented in the Verilog HDL language. A method is used where, at each step of the calculation, the value of either</p>	Aitkhozhayeva, Y.Zh., Тынymbayev, S., Adilbekkyzy, S., Skabylov, A., Ibraimov, M. Design and research of the behavioral model for the modular reduction device Том 17, Выпуск 1, Страницы 151 – 1562020 DOI: 10.31489/2020NO1/151-156

			<p>tripled, doubled, or single value of the module is subtracted from the most significant bits shifted to the left by two. Functional and timing modeling of the behavioral model algorithm using examples was carried out and the correctness of the algorithm was confirmed. The device circuit at the register transfer level (RTL) for the low-budget FPGA Cyclone VE 5CEBA4F23C7 from Altera is obtained. A timing analysis was performed using a time analyzer to determine the maximum clock frequency for the principal and behavioral models in various working conditions.</p>	
80.	<p><u>Halloysite nanotubes with immobilized plasmonic nanoparticles for biophotonic applications</u></p>	<p>DOI: 10.3390/app11104565 (IF= 0.435; Q2 in Chemistry, Physical)</p>	<p>ABSTRACT Halloysite nanotubes (HNTs) with immobilized gold (Au) and silver (Ag) nanoparticles (NPs) belong to a class of nanocomposite materials whose physical properties and applications depend on the geometry of arrangements of the plasmonic nanoparticles on HNT' surfaces. We explore HNTs:(Au, Ag)-NPs as</p>	<p>Kornilova A.V., Novikov S.M.,Kuralbayeva G.A., Jana S., Lysenko I.V., Shpichka A.I., Stavitskaya A.V., Gorbachevskii M.V., Novikov A.A., Ikramova S.B., Timashev P.S.,Arsenin A.V. <u>Halloysite nanotubes with immobilized plasmonic nanoparticles for biophotonic applications</u> Том 11, Выпуск 102 May 2021 DOI: 10.3390/app11104565</p>

			<p>potential nano-templates for surface-enhanced Raman scattering (SERS). The structure and plasmonic properties of nanocomposites based on HNTs and Au- and Ag-NPs are studied by means of the transmission electron microscopy and optical spectroscopy. The optical extinction spectra of aqueous suspensions of HNTs:(Au, Ag)-NPs and spatial distributions of the electric fields are simulated, and the simulation results demonstrate the corresponding localized plasmonic resonances and numerous “hot spots” of the electric field nearby those NPs. In vitro experiments reveal an enhancement of the protein SERS in fibroblast cells with added HNTs:Ag-NPs. The observed optical properties and SERS activity of the nanocomposites based on HNTs and plasmonic NPs are promising for their applications in biosensorics and biophotonics.</p>	
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81.	<p><u>Evaluating the effectiveness of information security based on the calculation of information entropy</u></p>	<p>DOI: 10.1088/1742-6596/1783/1/012042 (IF= 0.210; Q4 in Chemistry, Physical)</p>	<p>ABSTRACT</p> <p>Recently, the emergence and increasingly widespread of wireless networks has generated considerable interest in the information-theoretical approach to ensuring secure communications. The basic principle of information-theoretic security requires a combination of cryptographic methods with channel coding techniques that use the randomness of communication channels to ensure that messages sent cannot be intercepted or decrypted by a third party maliciously eavesdropping on the wireless medium. This paper discusses the information-entropy method for assessing security. We show that information-theoretical security means that any algorithm has a negligible probability of violating the security property. This is the same as unconditional security: it does not rely on any computational assumptions and is not limited to probabilistic violators.</p>	<p>Imanbayeva A., Tursynbek Y., Syzdykova R., Mukhamedova A Evaluating the effectiveness of information security based on the calculation of information entropy Том 1783, Выпуск 112 February 2021 DOI: 10.1088/1742-6596/1783/1/012042</p>
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82.	<u>Thermal Stability of the Structure and Optical Properties of Nanostructured TiO₂ Films</u>	DOI: 10.1007/s11182-021-02272-y (IF= 0.317; Q3 in Chemistry, Physical)	<p style="text-align: center;">Abstract</p> <p>The structure and optical properties of titanium dioxide films have been studied during annealing from 100 to 400°C. The films were obtained by ion-plasma high-frequency magnetron sputtering of polycrystalline rutile target in an argon atmosphere. It was shown that as-prepared TiO₂ films are nanostructured with ~8 nm rutile crystallites and ~3.3 Å interplanar distances and contain a small fraction of anatase. The optical band gap of the films is 3.01 eV, and the refractive index under normal conditions is 2.25. The film annealing at temperatures from 100 to 400°C does not practically change their structure, optical band gap, and refractive index under normal conditions, i.e., the obtained nanostructured TiO₂ films are thermally stable.</p>	Mikhailova S.L., Prikhodko O.Y., Mukhametkarimov Y.S., Dautkhan K., Doseke U.A., Kozyukhin S.A., Kozik V.V., Ismailova G.A., Maksimova S.Y., Tarapeyeva A.Y., Zhakypov A.S. <u>Thermal Stability of the Structure and Optical Properties of Nanostructured TiO₂ Films</u> Том 63, Выпуск 12, Страницы 2045 - 2051 April 2021 DOI: 10.1007/s11182-021-02272-y

83.	<u>Modernization of mechatronic smart windows system to counteract the spread of COVID-19</u>	DOI: 10.1088/1742-6596/1615/1/012018 (IF= 0.210, Q4 in Chemistry, Physical)	<p style="text-align: center;">ABSTRACT</p> <p>In terms of COVID-19 pandemic, the mechatronic system, essentially a smart window, supplemented with devices for interception and disinfection of drops and capsules with viruses and bacteria, both outside and inside. This allows preventing the ingress of infected aerosols into the room along with streams of air rising along the buildings and spreading inside it in the presence of infected people along with turbulent jets of air. With widespread use, the system helps to reduce the spread of infection, transmitted mainly by airborne droplets. The hardware for controlling the window system is performed on a board from the Arduino MEGA 2560 R3 ATMEGA16U2 family, two control boards with ten relays and ten sensor modules. Control program for the window system control circuit is written in the LabVIEW graphical programming</p>	L Mikhailov, S Mikhailova, R Yersaiyn, G Ismailova, N Kenes , R Makhmutov // <u>Modernization of mechatronic smart windows system to counteract the spread of COVID-19</u> // <u>Том 1615, Выпуск 125 August 2020</u> // DOI: 10.1088/1742-6596/1615/1/012018
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			environment (National Instrument USA).	
84.	<u>Extended H₂CO, SiO, and HC₃N emission in 43 southern star-forming regions</u>	DOI 10.3847/1538-4365/abd0fb (IF= 3.546; Q1 in Chemistry, Physical)	<p>ABSTRACT</p> <p>We have selected 43 southern massive star-forming regions to study the spatial distribution of H₂CO 4₀₄-3₀₃, SiO 2-1, and HC₃N 10-9 line emission and to investigate their spatial association with the dust emission. The morphology of H₂CO 4₀₄-3₀₃ and HC₃N 10-9 agrees well with the dust emission. HC₃N 10-9 tends to originate from more compact regions than H₂CO 4₀₄-3₀₃ and SiO 2-1. We divided our sources into three groups: those in the Central Molecular Zone (CMZ), those associated with bubbles (Bubble), and the remaining sources, which are termed "normal star-forming regions" (NMSFR). These three groups, subdivided into three different categories with respect to line widths, integrated intensities, and column densities, hint at the presence of different physical and chemical processes. We find that the dust</p>	He Y.-X., Henkel C., Zhou J.-J., Esimbek J., Stutz A.M., Liu H.-L., Ji W.-G., Li D.-L., Wu G., Tang X.-D., Kamesh T., Sailanbek S. <u>Extended H₂CO, SiO, and HC₃N emission in 43 southern star-forming regions</u> Том 253, Выпуск 116 February 2021 DOI 10.3847/1538-4365/abd0fb

			<p>temperature T_d, and the abundance ratios $N_{\text{HNCO}}/N_{\text{SiO}}$ and $N_{\text{HNCO}}/N_{\text{HC3N}}$ show a decreasing trend toward the central dense regions of CMZ sources, while $N_{\text{HC3N}}/N_{\text{SiO}}$ moves in the opposite direction. Moreover, a better agreement is found between T_d and $N_{\text{HC3N}}/N_{\text{SiO}}$ in Bubble and NMSFR category sources. Both outflow and inflow activities have been found in eight of the 16 bubble and NMSFR sources. The low outflow detection rate indicates either that in these sources the SiO 2–1 line wing emission is below our sensitivity limit or that the bulk of the SiO emission may be produced by the expansion of an H II region or supernova remnant, which has pushed molecular gas away, forming a shock and yielding SiO.</p>	
85.	<p>Ammonia observations towards the Aquila Rift cloud complex</p>	<p>DOI 10.1051/0004-6361/202037659 (IF= 2.137; Q1 in Chemistry, Physical)</p>	<p>Abstract</p> <p>We surveyed the Aquila Rift complex including the Serpens South and W 40 regions in the NH_3 (1,1) and (2,2) transitions making use of the Nanshan 26-</p>	<p>Tursun K., Esimbek J., Henkel C, Tang X., Wu G, Li D., Zhou J., He Y., Komesch T., Sailanbek S. Ammonia observations towards the Aquila Rift cloud complex Tom 6431 November 2020 DOI 10.1051/0004-6361/202037659</p>

			<p>m telescope. Our observations cover an area of $\sim 1.5^\circ \times 2.2^\circ$ ($11.4 \text{ pc} \times 16.7 \text{ pc}$). The kinetic temperatures of the dense gas in the Aquila Rift complex obtained from NH_3 (2,2)/(1,1) ratios range from 8.9 to 35.0 K with an average of $15.3 \pm 6.1 \text{ K}$ (errors are standard deviations of the mean). Low gas temperatures are associated with Serpens South ranging from 8.9 to 16.8 K with an average of $12.3 \pm 1.7 \text{ K}$, while dense gas in the W 40 region shows higher temperatures ranging from 17.7 to 35.0 K with an average of $25.1 \pm 4.9 \text{ K}$. A comparison of kinetic temperatures derived from para-NH_3 (2,2)/(1,1) against HiGal dust temperatures indicates that the gas and dust temperatures are in agreement in the low-mass-star formation region of Serpens South. In the high-mass-star formation region W 40, the measured gas kinetic temperatures are higher than those of the dust. The turbulent component of the velocity dispersion of NH_3 (1,1) is found to be</p>	
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			<p>positively correlated with the gas kinetic temperature, which indicates that the dense gas may be heated by dissipation of turbulent energy. For the fractional total-NH₃ (para+ortho) abundance obtained by a comparison with Herschel infrared continuum data representing dust emission, we find values from 0.1×10^{-8} to 2.1×10^{-7} with an average of $6.9 (\pm 4.5) \times 10^{-8}$. Serpens South also shows a fractional total-NH₃ (para+ortho) abundance ranging from 0.2×10^{-8} to 2.1×10^{-7} with an average of $8.6 (\pm 3.8) \times 10^{-8}$. In W 40, values are lower, between 0.1 and 4.3×10^{-8} with an average of $1.6 (\pm 1.4) \times 10^{-8}$. Weak velocity gradients demonstrate that the rotational energy is a negligible fraction of the gravitational energy. In W 40, gas and dust temperatures are not strongly dependent on the projected distance to the recently formed massive stars. Overall, the morphology of the mapped region is ring-like, with strong emission at lower and weak</p>	
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			emission at higher Galactic longitudes. However, the presence of a physical connection between the two parts remains questionable.	
86.	<u>G15.684-0.29: One of the Largest Galactic Infrared Bubbles Showing Strong Evidence of Triggered Star Formation</u>	DOI 10.3847/1538-4357/ab94c0 (IF = 2.376; Q1 in Chemistry, Physical)	<p>ABSTRACT</p> <p>The bubble G15.684-0.29 has a radius of 15.7 pc. Its large size indicates that it may have enough time to trigger star formation. We identify 39 dense cold clumps around the bubble from the Hi-GAL survey. All of them satisfy the criteria for forming massive stars, and most of them lie in the bubble shell. We identify 19 molecular clumps around the bubble from the ¹²CO(3–2) survey, all of which are gravitationally bound. We found 9 Class I YSOs, 28 Class II YSOs, and 12 transition disks (TDs) around the bubble. For those young stellar objects (YSOs) located within the bubble boundary, 6 of 7 Class I YSOs lie in the shell, 15 of 22 Class II YSOs lie inside the bubble, and 3 of 5 TDs lie inside the bubble. The dynamical age of G15.684-0.29 in a turbulent medium is ~4</p>	Zhou J., Zhou D, Esimbek J., Baan W., Wu G., Ji W., He Y., Li D., Sailanbek S, Komesh T., Tang X. G15.684-0.29: One of the Largest Galactic Infrared Bubbles Showing Strong Evidence of Triggered Star Formation Том 897, Выпуск 11 July 2020 DOI 10.3847/1538-4357/ab94c0

			<p>Myr, which is much greater than the shell fragmentation time, ~0.82–1.74 Myr. We suggest that triggered star formation may be ongoing in the shell of the bubble, and the collect and collapse model may work here. However, we cannot rule out the possibility that the radiation-driven implosion model may work on the formation of some YSOs. As we expected, the larger bubble has a much longer dynamical age, but we failed to find a clear age gradient for YSOs around the bubble.</p>	
87.	<p><u>Intelligent autonomous street lighting system based on weather forecast using LSTM</u></p>	<p>DOI 10.1016/j.energy.2021.120902 (IF= 1.961; Q1 in Modeling and Simulation)</p>	<p>ABSTRACT Existing traditional street lighting systems are characterized by a high level of energy consumption compared to automated intelligent systems that offer different operating modes depending on traffic and power system load. The most promising energy sources systems are hybrid installations that switch the load to the grid in adverse weather conditions. Such systems may increase the energy efficiency of the street</p>	<p>Tukymbekov D., Saymbetov A., Nurgaliyev M., Kuttybay N., Dosymbetova G., Svanbayev Y. <u>Intelligent autonomous street lighting system based on weather forecast using LSTM</u> <i>EnergyTom</i> 23115 September 2021 </p>

			<p>lighting system, but they are not completely autonomous. In this case, the most important problem is to provide the street lighting system with energy in adverse weather conditions. In this paper, an autonomous street lighting system with adaptive energy consumption based on weather forecast was shown. The proposed street lighting system is completely independent of traditional power sources and is completely powered by solar panels. The main energy consumers of a street lighting system are lamps. The consumption of lamps can be changed to the minimum brightness level required by outdoor lighting standards.</p> <p>Forecasts of energy generation by solar panels can be obtained using LSTM. It is based on weather and solar radiation forecasts data for the coming days. The brightness levels of lamps are calculated and changed using the methods proposed in this paper. The probability of reaching the critical level of batteries does</p>	
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			<p>not exceed 0.10% and fluctuates around 0.05% most of the time when simulating for 1000 days under random weather conditions. Simulation of energy consumption by the street lighting system using the proposed method shows stable and sustainable performance in Almaty, Kazakhstan. The obtained results in this work can be used for designing autonomous street lighting and outdoor lighting systems.</p>	
88.	<p><u>Physical processes during the formation of silicon-lithium p-i-n structures using double-sided diffusion and drift methods</u></p>	<p>DOI : 10.3390/ma14185174 (IF= 0.682; Q2 in Condensed Matter Physics)</p>	<p>ABSTRACT In this paper, we described a method of double-sided diffusion and drift of lithium-ions into monocrystalline silicon for the formation of the large-sized, p-i-n structured Si(Li) radiation detectors. The p-i-n structure is a p-n junction with a doped region, where the “i-region” is between the n and the p layers. A well-defined i-region is usually associated with p or n layers with high resistivities. The p-i-n structure is mostly used in diodes and in some types of semiconductor radiation detectors. The</p>	<p>Saymbetov A., Muminov R., Japashov N., Toshmurodov Y., Nurgaliyev M., Koshkarbay N., Kuttybay N., Zholamanov B., Jing Z. Physical processes during the formation of silicon-lithium p-i-n structures using double-sided diffusion and drift methods <i>Materials - Открытый доступ</i> - Том 14, Выпуск 18 September 2021 DOI : 10.3390/ma14185174</p>

			<p>uniqueness of this method is that, in this method, the processes of diffusion and drift of lithium-ions, which are the main processes in the formation of Si(Li) p-i-n structures, are produced from both flat sides of cylindrical-shaped monocrystalline silicon, at optimal temperature ($T = 420\text{ }^{\circ}\text{C}$) conditions of diffusion, and subsequently, with synchronous supply of temperature (from 55 to 100 $^{\circ}\text{C}$) and reverse bias voltage (from 70 to 300 V) during drift of lithium-ions into silicon.</p> <p>Thus, shortening the manufacturing time of the detector and providing a more uniform distribution of lithium-ions in the crystal volume.</p> <p>Since, at present, the development of manufacturing of large-sized Si(Li) detectors is hindered due to difficulties in obtaining a uniformly compensated large area and time-consuming manufacturing process, the proposed method may open up new possibilities in detector manufacturing.</p>	
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89.	<u>Dual-axis schedule tracker with an adaptive algorithm for a strong scattering of sunbeam</u>	DOI: 10.1016/j.solener.2021.06.024 (IF= 1.337; Q1 in General Materials Science)	ABSTRACT The efficiency of photovoltaic panels is one of the main challenges of solar energy today. The sharp decline in solar cell performance in cloudy weather is the most significant limiting factor for the transition to a green economy. As a result, today's priority task is the development of various algorithms to improve the performance of solar cells in cloudy weather. This paper compares the performance of dual-axis schedule tracker and dual-axis schedule tracker with an adaptive algorithm for a strong scattering of the sun's rays by clouds. A comparative analysis of the manufactured trackers operation in adverse weather conditions was performed and with the use of small solar panels, an effective method was proposed for determining the minimum flow of solar energy entering the surface of photovoltaic installations with strong cloud scattering. The developed dual-axis method of tracking the sun	Saymbetov A., Mekhilef S., Kuttybay N., Nurgaliyev M., Tukymbekov D., Meiirkhanov A., Dosymbetova G., Svanbayev Y. Dual-axis schedule tracker with an adaptive algorithm for a strong scattering of sunbeam <i>Solar Energy</i> Том 224, Страницы 285 - 297 August 2021 DOI: 10.1016/j.solener.2021.06.024
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			<p>is 41% more efficient than the dual-axis schedule tracker. The energy produced by trackers with high-power panels for three months in the previous three years was also estimated using available meteorological data in Almaty, Kazakhstan.</p> <p>The results obtained can be used to design solar trackers in areas with a high probability of intense solar energy scattering on clouds.</p>	
90.	<p><u>Design of autonomous mobile PV system for remote regions</u></p>	<p>DOI 10.1109/EMES52337.2021.9484109</p>	<p>Abstract:</p> <p>The paper describes the concept of a mobile automated solar power plant and given three dimensional models. The main structural units of an automated mobile power plant are shown and described. The relevance of this work is to develop a mobile source of green energy for remote areas in which there is no uninterrupted power supply, as well as a replacement for fuel generators. The paper shows the calculations of the power parameters of the lifting mechanism, as well as the algorithm of the automated power plant and the electrical</p>	<p>Saymbetov A., Nurgaliyev M., Kutybay N., Abdullozoda M., Dosymbetova G., Tukymbekov D. Design of autonomous mobile PV system for remote regions <i>2021 16th International Conference on Engineering of Modern Electric Systems, EMES 2021 - Proceedings</i> 10 June 2021 Номер статьи 9484109 16th International Conference on Engineering of Modern Electric Systems, EMES 2021 Virtual, Oradea 10 June 2021 DOI 10.1109/EMES52337.2021.9484109</p>

			<p>circuit of the control unit. A theoretical model of a solar battery based on two diodes is presented and the characteristic of a solar panel is shown.</p>	
91.	<p><u>Optimized single-axis schedule solar tracker in different weather conditions</u></p>	<p>DOI 10.3390/en13195226 (IF= 0.598; Q1 in Control and Optimization)</p>	<p>ABSTRACT</p> <p>Improving the efficiency of solar panels is the main task of solar energy generation. One of the methods is a solar tracking system. One of the most important parameters of tracking systems is a precise orientation to the Sun. In this paper, the performance of single-axis solar trackers based on schedule and light dependent resistor (LDR) photosensors, as well as a stationary photovoltaic installation in various weather conditions, were compared. A comparative analysis of the operation of a manufactured schedule solar tracker and an LDR solar tracker in different weather conditions was performed; in addition, a simple method for determining the rotation angle of a solar tracker based on the encoder was proposed. Finally, the</p>	<p>Kuttybay N., Saymbetov A., Mekhilef S., Nurgaliyev M., Tukymbekov D., Dosymbetova G., Meirkhanov A., Svanbayev Y. Optimized single-axis schedule solar tracker in different weather conditions <i>Energies</i> Открытый доступ Том 13, Выпуск 19 October 2020 DOI 10.3390/en13195226</p>

			<p>performance of the manufactured solar trackers was calculated, taking into account various weather conditions for one year. The proposed single-axis solar tracker based on schedule showed better results in cloudy and rainy weather conditions. The obtained results can be used for designing solar trackers in areas with a variable climate.</p>	
92.	<p>Prediction of energy consumption for LoRa based wireless sensors network</p>	<p>DOI 10.1007/s11276-020-02276-5 (IF= 0.417; Q2 in Information Systems)</p>	<p>Abstract This paper shows a method for predicting the lifetime of a wireless sensor network based on the LoRa Ra-01 wireless modules. To develop a prediction model of the energy consumption, wireless sensor modules were assembled and it was obtained experimental data using LabView development environment. There were performed experiments to get battery discharge curve. Experimental data of power consumption depending on the packet length were obtained in transmission mode. Using experimental data, we obtained</p>	<p>Nurgaliyev, M., Saymbetov, A., Yashchyshyn, Y., Kutybay, N., Tukymbekov, D. //Prediction of energy consumption for LoRa based wireless sensors network //Wireless Networks Том 26, Выпуск 5, Страницы 3507 - 35201 July 2020 DOI 10.1007/s11276-020-02276-5</p>

			<p>dependencies of system lifetime on sleep mode duration and packet length. The paper also considered a probabilistic approach to predict the system lifetime depending on the probability of data transmission during the day. The lifetime prediction model is based on Markov's chains. The results obtained in this work can be used to predict lifetime of sensor networks more accurately.</p>	
93.	<p><u>Digital modeling accuracy of direct metal laser sintering process</u></p>	<p>DOI 10.18321/ectj959 (IF= 0.227; Q3 in General Chemical Engineering)</p>	<p>Abstract</p> <p>Products obtained by metal additive manufacturing have exceptional strength properties that can be compared with forged parts, and in some cases, even surpass them. Also, the cost and time of parts manufacture are reduced by two or even three times.</p> <p>Because of this, today's leading corporations in the field of aerospace industry introducing this technology to its production. To avoid loss of funds and time, the processes of additive manufacturing should be predictable. Simufact Additive is specialized</p>	<p>Dmitriyev, T., Manakov, S. <i>Eurasian Chemico-Technological Journal</i> Открытый доступ Том 22, Выпуск 2, Страницы 123 – 127 2020 Digital modeling accuracy of direct metal laser sintering process DOI 10.18321/ectj959</p>

			<p>software for additive manufacturing process simulation is dedicated to solving critical issues with metal 3D printing, including significantly reducing distortion; minimize residual stress to avoid failures; optimize the build-up orientation and the support structures. It also enables us to compare simulated parts with the printed sample or measure it as a reference. In other words, the simulated deformations can be estimated concerning the reference geometry. The current work aims to study the deformation of the sample during the Direct Metal Laser Sintering (DMLS) process made from Maraging Steel MS1. Simufact Additive software was used to simulate the printing process. The main idea is to compare the results of the simulation and the real model. EOS M290 metal 3D printer was used to make a test specimen.</p>	
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94.	<p><u>The prolonged gamma ray enhancement and the short radiation burst events observed in thunderstorms at Tien Shan</u></p>	<p>DOI 10.1016/j.atmosres.2020.105266 (IF=1.488; Q1 in Atmospheric Science)</p>	<p>ABSTRACT</p> <p>We report the observation results of the hard radiation flashes which accompanied the lightning discharges above the mountains of Northern Tien Shan. Time series of the counting rate intensity, numerical estimations of absolute flux, and energy distribution of accelerated electrons and of (20–2000) keV gamma rays were obtained at the height of 3700 m a. s. l., immediately within thunderclouds, and in closest vicinity ($\lesssim 100$ m) to discharge region. Two different kinds of radiation emission events are presented here: a relatively prolonged rise of gamma ray intensity with minute-scale duration (the thunderstorm ground enhancement, TGE) which has preceded a negative field variation, and a short sub-millisecond radiation burst, which accompanied a close lightning discharge in thundercloud. It was revealed also an indication to positron generation in thunderclouds at the time of gamma ray</p>	<p>Shepetov A., Antonova V. , Kalikulov O. , Kryakunova O. , Karashtin A. , Lutsenko V. , Mamina S. , Mukashev K. , Piscal V. , Ptitsyn M. , Ryabov V. , Sadykov T. <u>The prolonged gamma ray enhancement and the short radiation burst events observed in thunderstorms at Tien Shan</u> DOI 10.1016/j.atmosres.2020.105266</p>
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			<p>emission, as well as modulation of the neutron counting rate in Tien Shan neutron monitor which was operating at a (1.5–2) km order distance from the region of lightning development.</p>	
95.	<p><u>Evolution of a Nanocrystalline Structure of the Cobalt Metal in Annealing</u></p>	<p>DOI 10.21272/jnep.12(6).06027 (IF= 0.225; Q3 in General Materials Science)</p>	<p>Abstract It is shown that the boundaries of grains formed during severe plastic deformation of cobalt are highangle, nonequilibrium, adjacent to distorted regions of the crystal lattice. These distortions are caused by the fields of elastic stresses introduced by grain boundary dislocations. The density of dislocations in the bulk of nanocrystals reaches 1010 cm². The large length of nonequilibrium boundaries and the high density of defects play a decisive role in the formation of physical and mechanical properties and determine the low thermal stability of nanocrystalline materials: grain growth begins at relatively low temperatures during the recovery of the cobalt structure. This process</p>	<p>Gabdrakhmanova, L.A., Mukashev, K.M., Umarov, F.F., Muradov, A.D., Yar-Mukhamedova, G.S. <u> Evolution of a Nanocrystalline Structure of the Cobalt Metal in Annealing </u><i>Journal of Nano- and Electronic Physics</i><u>Открытый доступ</u>Том 12, Выпуск 6, Страницы 06027-1 - 06027-62020 DOI 10.21272/jnep.12(6).06027</p>

			<p>develops smoothly up to 300 °C. A sharp change in these properties occurs during recrystallization at $T > 300$ °C and then they practically do not change. Above $T > 400$ °C, the cobalt structure became completely recrystallized and further coarsening of grains is observed. In this case, the abnormal growth of perfect grains occurs due to the absorption of small imperfect cells. As a result of the redistribution and annihilation of dislocations in the boundaries and in the volume of grains, the processes of recrystallization occur according to the diffusion mechanism.</p>	
96.	<p><u>Intensive plastic deformation influence on phase relations of cobalt nanocrystals</u></p>	<p>DOI 10.21272/jnep.12(1).01010 (IF = 0.225; Q3 in General Materials Science)</p>	<p>Abstract The choice of cobalt as an object of study is due to the fact that it is characterized by a low temperature of polymorphic transformation. This makes it possible to use it as a model material for studying the effect of crystallite sizes on the nature of these transitions and phase composition. Nanostructured</p>	<p>Gabdrakhmanova, L.A., Mukashev, K.M., Muradov, A.D., Umarov, F.F., Yar-Mukhamedova, G.S. Journal of Nano- and Electronic Physics, 2020, (1), 01010 <u>Intensive plastic deformation influence on phase relations of cobalt nanocrystals</u> DOI 10.21272/jnep.12(1).01010</p>

			<p>samples of cobalt were obtained by the method of intense plastic deformation by torsion. High quasi-hydrostatic pressure in the working area up to 8 GPa was created on a Bridgman anvil-type installation. Anvils were made of tungsten carbide. The method allows to obtain samples of high purity without pores and impurities. Xray diffraction studies were carried out on a DRON-7 diffractometer with cobalt radiation. X-ray analysis was performed according to the Bragg-Brentano method. To conduct phase analysis, $K\alpha$ lines were used at a scan step of 0.04 degrees, and when analyzing the profile of diffraction lines and determining their width – at 0.01 degrees. The absolute error in measuring the angular positions of diffraction maxima did not exceed ± 0.020. The size of cobalt nanocrystallites reached about 25-50 nm. It is established that during lowtemperature annealing recovery occurs in the structure</p>	
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			<p>of cobalt. Annealing above 300 °C leads to the recrystallization of its structure. The nanocrystalline cobalt obtained by intense plastic torsion deformation after heating above the phase transition temperature and cooling below this temperature retains the hightemperature fcc structure. It is shown that the nature of the fcc-hcp transition delay can be associated with changes in the size and strained state of crystallites forming nanocrystalline cobalt. All of the above confirms the relevance of our research.</p>	
97.	<p><u>Measurement of the low-energy neutron and gamma ray accompaniment of extensive air showers in the knee region of primary cosmic ray spectrum</u></p>	<p>DOI 10.1140/epjp/s13360-019-00092-1 (IF= 0.650; Q1 in General Physics and Astronomy)</p>	<p>Abstract Purposeful investigation of radiation fluxes strongly delayed in relation to the main particles front of extensive air shower (EAS) was undertaken at the Tien Shan Mountain Cosmic Ray Station. It was found that the passage of the EAS can be accompanied by the delayed thermal neutrons and by the soft (30–50) keV gamma rays, mostly concentrated within a region of about (5–10) m around shower</p>	<p>Shepetov A. ,Chubenko A. ,Iskhakov B. ,Kryakunova O. ,Kalikulov O. ,Mamina S. ,Mukashev K. ,Piscal V. ,Ryabov V. ,Saduyev N. ,Sadykov T. ,Salikhov N. Measurements of the low-energy neutron and gamma ray accompaniment of extensive air showers in the knee region of primary cosmic ray spectrum <i>European Physical Journal Plus</i> Открытый доступ Том 135, Выпуск 11 January 2020</p> <p>DOI 10.1140/epjp/s13360-019-00092-1</p>

			<p>axis, where the integral radiation fluence can vary in the limits of $(10^{-4} - 1) \text{ cm}^{-2}$ for neutrons, and of $(0.1 - 1000) \text{ cm}^{-2}$ for gamma rays.</p> <p>The dependence of signal multiplicity on the shower size N_e has a power shape both for the neutron and gamma ray components, with a sharp increase of its power index around the value of $N_e \approx 10^6$, which corresponds to the position of the $3 \cdot 10^{15} \text{ eV}$ knee in the primary cosmic ray spectrum. Total duration of detectable radiation signal after the EAS passage can be of some tens of milliseconds in the case of neutron component, and up to a few whole seconds for gamma rays. The delayed accompaniment of low-energy radiation particles can be an effective probe to study the interaction of the hadronic component of EAS.</p>	
Кафедра физики плазмы, нанотехнологии и компьютерной физики				

98.	Dust-Acoustic Wave Dispersion in Thermal Dusty Plasmas at Weak and Moderate Couplings	DOI 10.1109/TPS.2021.3078344 (IF=2.4; Q2 in IEEE Transactions on Plasma Science)	The dispersion of dust-acoustic waves (DAWs) in weakly and moderately coupled thermal dusty plasmas is studied in the framework of the linear density-response formalism with the static local-field correction for interdust interactions. The plasma medium composition and the charge of dust particles are simultaneously determined within a recently developed chemical model (Physical Review E, vol. 101, 063203, 2020) based on minimizing the Helmholtz free energy of the system under investigation. Stemming from the generalized Poisson-Boltzmann equation, the renormalization procedure is consistently applied to derive an interdust screened potential that takes into account the finiteness of dust grains. Within the framework of the Ornstein-Zernike relationship in the hypernetted chain approximation, the static structure factor of the dust component is evaluated to manifest the appearance of local extrema on its	Davletov, A., Kurbanov, F., Mukhametkarimov, Y., Yerimbetova, L. Dust-Acoustic Wave Dispersion in Thermal Dusty Plasmas at Weak and Moderate Couplings (2021) IEEE Transactions on Plasma Science, 49 (6), статья № 9439058, pp. 2000-2007. DOI: 10.1109/TPS.2021.3078344
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			<p>wavenumber dependence, thereby indicating the short-range order formation in the arrangement of dust particles with respect to one another. It is shown that the DAW dispersion law is completely governed by the static structure factor and, therefore, exhibits a nonmonotonic dependence on the wavenumber as well. In the long-wavelength limit, the acoustic-like behavior of the DAW dispersion is strictly confirmed and the corresponding phase speed, reduced in units of the dust thermal velocity, is ultimately expressed via the static structure factor at zero wavenumber. © 1973-2012 IEEE.</p>	
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99.	Performance optimization of back-contact perovskite solar cells with quasi-interdigitated electrodes	DOI10.1016/j.solener.2020.05.034 (IF=8.9 ;Q1 in Solar Energy)	A numerical simulation method is used to investigate intricacies of a complex relation between the back-contact electrode (BCE) geometric parameters, the perovskite photo-absorber layer electronic properties, and device performance in back-contact perovskite solar cells (BC-PSCs) with quasi-interdigitated electrodes (QIDEs). To unlock the full potential of BC-PSC with QIDEs, the device performance was investigated by systematically varying the geometric parameters of BCE and the perovskite photo-absorber layer electronic parameters in order to determine the conditions for a best device performance. BC-PSC with QIDEs have a potential to produce power conversion efficiencies (PCEs) higher than PSCs with the conventional sandwich architecture if optimized parameters for electrode geometry and perovskite electronic properties are used. The findings of the present work give an insight into the work principle of these devices and provide a theoretical	Shalenov, E.O., Dzhumagulova, K.N., Ng, A., Jumabekov, A.N. Performance optimization of back-contact perovskite solar cells with quasi-interdigitated electrodes (2020) Solar Energy, 205, pp. 102-108. Цитировано 4 раз.DOI: 10.1016/j.solener.2020.05.034
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			<p>guidance for design and fabrication of high-performance BC-PSC with QIDEs. © 2020 International Solar Energy Society</p>	
100.	<p>The pulse vacuum-arc plasma generator for nanoengineering application</p>	<p>DOI10.1007/s00339-020-03922-7 (IF=3.5 ;Q2 in Applied Physics A: Materials Science and Processing)</p>	<p>In paper described the results of work on the application of vacuum-arc machine in nanoengineering area. Researches were carried out to optimize the operation of this machine for the synthesis of nanomaterials in low-pressure arc-discharge plasma, plasma diagnosis and production of nanopowders. An electrode system based on the grounded cathode with impulse ignition has been developed. The anode current was measured and the mass output of the product was calculated. Experimental data on energy density were obtained, confirming the presence of plasma focusing on the electrode</p>	<p>Zhukeshov, A.M., Gabdullina, A.T., Amrenova, A.U., Fermakhan, K. The pulse vacuum-arc plasma generator for nanoengineering application (2020) Applied Physics A: Materials Science and Processing, 126 (9), статья № 742, .DOI: 10.1007/s00339-020-03922-7</p>

			<p>system axis due to its own magnetic field, the focus value of which reaches about 18 kJ/m². Powder samples were also obtained in the form of clusters containing the copper particles (up to 98%) and spherical powder with size from 116 nm to 1.2 μm. Homogeneity and dispersion of powder depended on the time of the processes accompanying the deposition. © 2020, Springer-Verlag GmbH Germany, part of Springer Nature.</p>	
101.	<p>Pulsed vacuum arc plasma deposition of films and particles at different pressures and temperatures</p>	<p>DOI10.1615/HighTempMatProc.2020034924 (IF=1.1 ;Q3 in High Temperature Material Processes)</p>	<p>The conditions of powder and film deposition at different pressures in the working chamber and the influence of substrate temperature in using of vacuum arc discharge are investigated. The experiments were carried out on a VAS-1 vacuum arc sprayer with known parameters of discharge circuit. The optimal pressure regime for deposition of thin films of nanoscale thickness was 10–3 mbar or below. The calculated estimation time for film deposition ratio was about 1 μm/min. In the experiment the thin layers of copper at pressure</p>	<p>Amrenova, A.U., Zhukeshov, A.M., Ibraev, B.M., Gabdullina, A.T., Useinov, B.M., Mukhamedryskyzy, M., Fermakhan, K. Pulsed vacuum arc plasma deposition of films and particles at different pressures and temperatures (2020) High Temperature Material Processes, 24 (2), pp. 157-165. Цитирован(ы) 1 раз.</p>

			<p>10–4 mbar was observed. When a plasma was produced on a cold substrate, a continuous film was not observed. The optimal pressure for producing nanopowders was equal to 10–2 mbar; particle agglomeration and the formation of a fractal structure were observed at this pressure. Individual spherical particles with a size of 100–600 nm were deposited at a pressure of 10–3 mbar. In their composition, elements of a substrate and electrode materials were found. The recommendations for choosing optimal modes to obtain nanosize coatings by the vacuum arc method and technological conditions for obtaining nanopowders using the pulse installation for industrial application was given. © 2020 by Begell House, Inc.</p>	
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102.	[International ENTER project: A new pedagogical training approach for engineering educators]	DOI10.31992/0869-3617-2020-6-65-74 (IF=1.4 ;Q2 in Vysshee Obrazovanie v Rossii)	The formation of a modern generation of engineers capable to drive changes that meet the requirements of the future necessitates a new approach in pedagogical training of engineering teachers. The international ENTER (EngineeriNg educaTors pEdagogical tRaining) project is being developed as part of EU Erasmus program focused on addressing the actual education needs from the standpoint of human and social capitals development both in Europe and in other countries. The ENTER project is aimed at the creation and development of an international platform for multilevel vocational training/retraining of technical universities teachers on the basis of the Eurasian interaction network. Surveys among employers, teachers, and engineering university students, as well as scientific periodicals analysis allowed us to determine the complex of universal and specific engineering and pedagogical competencies that educators should master not only	Shageeva, F.T., Mishchenko, E.S., Chernyshov, N.G., Nurgalieva, K.E., Turekhanova, K.M., Omirzhanov, Y.T. International ENTER project: A new pedagogical training approach for engineering educators
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			<p>for today, but also for the future needs. Based on the competency analysis, a three-level modular teacher training/retraining program (iPET program) has been developed and its international accreditation is planned. © 2020 Moscow Polytechnic University. All rights reserved.</p>	
103.	<p>Molecular dynamics investigation of soliton propagation in a two-dimensional Yukawa liquid</p>	<p>DOI10.1002/ctpp.201900197 (IF=2.1 ;Q3 in Contributions to Plasma Physics)</p>	<p>We investigate via molecular dynamics simulations the propagation of solitons in a two-dimensional many-body system characterized by Yukawa interaction potential. The solitons are created in an equilibrated system by the application of electric field pulses. Such pulses generate pairs of solitons, which are characterized by a positive and negative density peak, respectively, and which propagate into opposite directions. At small perturbation, the features propagate with the longitudinal sound speed, from</p>	<p>Donkó, Z., Hartmann, P., Masheyeva, R.U., Dzhumagulova, K.N. Molecular dynamics investigation of soliton propagation in a two-dimensional Yukawa liquid (2020) Contributions to Plasma Physics, 60 (8), статья № e201900197, DOI: 10.1002/ctpp.201900197</p>

			<p>which an increasing deviation is found at higher density perturbations. An external magnetic field is found to block the propagation of the solitons, which can, however, be released upon the termination of the magnetic field and can propagate further into directions that depend on the time of trapping and the magnetic field strength. © 2020 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim</p>	
104.	Dynamic characteristics of three-dimensional strongly coupled plasmas	DOI10.1103/PhysRevE.102.053215(IF=4.3 ;Q1 in Physical Review E)	<p>The dynamic structure factor and other dynamic characteristics of strongly coupled one-component plasmas have been studied [Yu. V. Arkhipov, Phys. Rev. Lett. 119, 045001 (2017)PRLTAO0031-900710.1103/PhysRevLett.119.045001] using the self-consistent version of the method of moments. Within any version of the latter, the system dielectric function satisfies all involved sum rules and other exact relations automatically, and the advantage of this version is that, in addition, the dynamic characteristics (the dynamic structure factor, the dispersion,</p>	<p>Arkhipov, Y.V., Ashikbayeva, A., Askaruly, A., Davletov, A.E., Dubovtsev, D.Y., Santybayev, K.S., Syzganbayeva, S.A., Conde, L., Tkachenko, I.M. Dynamic characteristics of three-dimensional strongly coupled plasmas (2020) Physical Review E, 102 (5), статья № 053215,DOI: 10.1103/PhysRevE.102.053215</p>

			<p>and decay parameters of the collective modes) are all expressed in terms of the static ones (the static structure factor) without any adjustment to the simulation data. The approach outlined in the aforementioned Letter is justified in detail and applied mainly to the classical Coulomb systems achieving satisfactory agreement with new numerical simulation data. It is shown how the realm of applicability of the method can be extended to partly degenerate and multicomponent systems, even to simple liquids. Some additional theoretical results are presented in the Supplemental Material. © 2020 American Physical Society.</p>	
105.	Optical Properties of Dense Plasmas	DOI10.1134/S1063780X20010018 (IF=1.8 ;Q3 in Plasma Physics Reports)	<p>Abstract—: The results of studies of optical properties of plasmas in the framework of the self-consistent method of moments, which are in satisfactory agreement with experimental data, are presented. The proposed calculation method differs from other theoretical approaches in the absence of fitting parameters and requires only knowledge of</p>	<p>Arkhipov, Y.V., Dubovtsev, D.Y., Syzganbayeva, S.A., Tkachenko, I.M. Optical Properties of Dense Plasmas (2020) Plasma Physics Reports, 46 (1), pp. 71-76 DOI: 10.1134/S1063780X20010018</p>

			<p>partial static structural plasma factors for calculations. The results were obtained in a wide range of the system parameters. © 2020, Pleiades Publishing, Ltd.</p>	
106.	<p>Generation and Diagnostics of Pulse Plasma Flows</p>	<p>DOI10.1134/S1063780X20040121 (IF=1.8 ;Q3 in Plasma Physics Reports)</p>	<p>Abstract: Pulsed plasma accelerators are widely used for the production of high-temperature pulsed plasma flows for fundamental and practical applications. The basic parameters of pulsed plasma accelerators are the characteristics of the external electric and magnetic circuits, as well as the structural and energy properties of the plasma flow. This work aims to characterize an IPU-30 pulsed plasma accelerator. The triple Langmuir probe method, calorimetric plasma energy density measurements, Rogowski coil, and high-speed visible imaging with a Phantom VEO710S fast camera are used to diagnose the pulsed plasma obtained in the IPU-30. The local plasma parameters such as electron temperature and density, the energy density of the pulsed</p>	<p>Tazhen, A.B., Rayimkhanov, Z.R., Dosbolayev, M.K., Ramazanov, T.S. Generation and Diagnostics of Pulse Plasma Flows (2020) Plasma Physics Reports, 46 (4), pp. 465-471. DOI: 10.1134/S1063780X20040121</p>

			<p>plasma flow, pulsed plasma current, and also discharge current are experimentally obtained at different discharge voltages and air pressure in the chamber. The typical waveforms of the triple probe and Rogowski coil are presented in the form of oscillograms. The images of plasma formation in the discharge gap are obtained and the velocity of a pulsed plasma flow is measured. © 2020, Pleiades Publishing, Ltd.</p>	
107.	<p>Destruction of a dust particle in the white dwarf atmosphere</p>	<p>DOI10.35848/1347-4065/ab7697 (IF=2.7 ;Q2 in Japanese Journal of Applied Physics, Part 1: Regular Papers & Short Notes)</p>	<p>Dusty white dwarfs are natural objects for studying the properties of cosmic dusty plasmas. We present the results of computation of the charge, radius, and temperature of a carbon dust particle in the atmosphere of dusty white dwarf G29-38, which is a typical example of a dusty white dwarf. The calculation results show that dust particles life-time in the atmospheres of dusty white dwarfs is of the order of microsecond. Therefore, dust particles cannot be sustained in a typical white dwarf atmosphere. © 2020 The Japan Society of Applied Physics.</p>	<p>Kenzhebekova, A.I., Bastykova, N.K., Kodanova, S.K., Ramazanov, T.S., Maiorov, S.A., Moldabekov, Z.A. Destruction of a dust particle in the white dwarf atmosphere (2020) Japanese Journal of Applied Physics, 59 (SH), статья № SHHA04, DOI: 10.35848/1347-4065/ab7697</p>

108.	Collision between a charged particle and a polarizable neutral particle in plasmas	DOI10.1063/5.0004163(IF=3.9 ;Q2 in Physics of Plasmas)	The collision of a polarizable neutral particle with a charged particle in plasmas is studied. The neutral particle interaction with a charged particle is considered to be due to an induced dipole moment. Taking into account screening and a finite size of colliding particles, we present accurate and simple interpolation formulas for the total scattering cross section in the case of contact of the neutral particle with the dust particle surface. The results are obtained for both weak and strong coupling between colliding particles. © 2020 Author(s).	Bastykova, N.K., Moldabekov, Z.A., Kodanova, S.K., Ramazanov, T.S. Collision between a charged particle and a polarizable neutral particle in plasmas (2020) Physics of Plasmas, 27 (4), статья № 044502, . DOI: 10.1063/5.0004163
109.	[Investigation of the evolution of Be, Ni, Mo and W dust particles in fusion plasma]	(IF=0.3 ;Q4 in Applied Physics)	In this work the evolution of dust particles from various materials used in fusion power devices is investigated. A model for describing dust formation is constructed, and estimates of the dust lifetimes in the edge fusion plasma are obtained. The model is taken into account thermochemical, electrical and other properties of materials. It is shown that the dominant process of reducing the dust mass is thermal evaporation, which depends on the pressure	Bastykova, N.Kh., Golyatina, R.I., Kodanova, S.K., Ramazanov, T.S., Maiorov, S.A. Investigation of the evolution of Be, Ni, Mo and W dust particles in fusion plasma [Article@Исследование эволюции пылинок из Be, Ni, Mo и W в термоядерном реакторе] (2020) Applied Physics, (3), pp. 21-26.

			<p>of saturated vapor at a temperature of thermal equilibrium. Estimates of the dust lifetime from different materials depending on the plasma parameters are obtained. The presented results can be useful for estimating the length of the dust penetration into the depth of the fusion reactor. The difference in the dynamics of particles from light and heavy elements is shown. Of the four elements examined (Be, Ni, Mo, and W), nickel exhibits the highest mobility due to its long life and moderate weight. © 2020 Federal Informational-Analytical Center of the Defense Industry. All rights reserved.</p>	
110.	Surface Waves in a Collisional Quark-Gluon Plasma	DOI10.1134/S1547477120060035(IF=1.1 ;Q3 in Physics of Particles and Nuclei Letters)	<p>Abstract: Surface waves propagating in the semi-bounded collisional hot QCD medium (quark-gluon plasma) are considered. To investigate the effect of collisions as damping and non-ideality factor, the longitudinal and transverse dielectric functions of the quark-gluon plasma are used within the Bhatnagar–Gross–Krook (BGK) approach. The results were obtained both analytically and</p>	<p>Baiseitov, K., Moldabekov, Z.A., Blaschke, D., Djienbekov, N., Ramazanov, T.S. Surface Waves in a Collisional Quark-Gluon Plasma (2020) Physics of Particles and Nuclei Letters, 17 (6), pp. 803-808. DOI: 10.1134/S1547477120060035</p>

			<p>numerically in the long wavelength limit. First of all, collisions lead to smaller values of surface wave frequency and their stronger damping. Secondly, the results show that non-ideality leads to the appearance of a new branch of surface waves compared to the collisionless case. The relevance of the surface excitations (waves) for the QGP realized in experiments is discussed. © 2020, Pleiades Publishing, Ltd.</p>	
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111.	Melting, freezing, and dynamics of two-dimensional dipole systems in screening bulk media	DOI10.1103/PhysRevE.102.033205(IF=4.3 ;Q1 in Physical Review E)	<p>This paper reports on the molecular dynamics simulations of classical two-dimensional (2D) electric dipole systems. The properties of 2D systems with bare (nonscreened) and screened dipole-dipole interactions have been investigated. Based on the polygon construction method, we present simulation results on the phase transition, and we locate the melting and freezing points of 2D dipole systems in terms of a polygon disorder parameter, with the polygon disorder parameter being the sum of nontriangular polygon order parameters. It was found that the phase transition of the system occurs when the polygon disorder parameter has a value 0.165. This result was cross-checked by using both local and overall orientational order parameters. We also identified that the value of the average local orientational order parameter at the phase transition point is 0.67. These results are valid for the ordinary (bare) dipole-dipole interaction as well as the screened dipole-dipole</p>	<p>Aldakul, Y.K., Moldabekov, Z.A., Ramazanov, T.S. Melting, freezing, and dynamics of two-dimensional dipole systems in screening bulk media (2020) Physical Review E, 102 (3), статья № 033205, DOI: 10.1103/PhysRevE.102.033205</p>
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			<p>interaction, and they are expected to be general for other 2D systems with repulsive pair interaction. We observed that both melting and freezing points shift to lower values of temperature due to screening. In the liquid state, the radial distribution function and polygon construction method show the loss of order in a structure as screening becomes more severe. Furthermore, the impact of screening on the system's collective excitation spectra and diffusive characteristics at liquid and solid states has been studied. Results show the decrease in the values of both longitudinal and transverse sound speeds and the emergence of anomalous superdiffusive motion in the liquid state due to screening. © 2020 American Physical Society.</p>	
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112.	Synthesis of carbon nanowalls on the surface of nanoporous alumina membranes by RI-PECVD method	DOI10.1016/j.apsusc.2020.146533 (IF=10.7 ;Q1 in Applied Surface Science)	<p>This work is devoted to the synthesis of carbon nanowalls on the surface of a nanoporous aluminum oxide membrane by radical-injection plasma enhanced chemical vapor deposition method. Nanoporous alumina oxide membranes with different morphology and thickness, which were obtained by the method of two-stage electrochemical anodization, were used as a substrate. For comparative analysis, carbon nanowalls were also obtained on the surface of a silicon substrate and aluminum foil. The synthesized nanostructures were investigated by using scanning electron microscopy and Raman spectroscopy. The dependence of the morphology and height of carbon nanowalls on the pore size and the thickness of the alumina membrane, respectively, was revealed. © 2020 Elsevier B.V.</p>	<p>Yerlanuly, Y., Christy, D., Van Nong, N., Kondo, H., Alpysbayeva, B., Nemkayeva, R., Kadyr, M., Ramazanov, T., Gabdullin, M., Batryshev, D., Hori, M. Synthesis of carbon nanowalls on the surface of nanoporous alumina membranes by RI-PECVD method (2020) Applied Surface Science, 523, статья № 146533, DOI: 10.1016/j.apsusc.2020.146533</p>
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113.	Electron runaway in a dense semiclassical plasma	DOI10.1016/j.hedp.2020.100832 (IF=1.9 ;Q2 in High Energy Density Physics)	The phenomenon of electron runaway in a dense semiclassical plasma was investigated on the basis of the effective potentials of particle interactions. These effective potentials take into account the quantum-mechanical effect of diffraction and static or dynamic screening. The results of numerical calculations of the effective collision frequency, mean free path and friction force for various values of the density parameter and coupling parameter are presented. It is shown that the dynamic screening led to an increase in the friction force. © 2020	Jumagulov, M.N., Seisembayeva, M.M., Shalenov, E.O., Kossymkyzy, Z., Ramazanov, T.S., Dzhumagulova, K.N. Electron runaway in a dense semiclassical plasma (2020) High Energy Density Physics, 36, статья № 100832, DOI: 10.1016/j.hedp.2020.100832
114.	Thermodynamics and statistical physics of quasiparticles within the quark-gluon plasma model	DOI10.1142/S0217732320501941(IF=2.7 ;Q2 in Modern Physics Letters A)	We consider thermodynamic properties of a quark-gluon plasma related to quasiparticles having the internal structure. For this purpose, we employ a possible analogy between quantum chromodynamics and non-Abelian Proca-Dirac-Higgs theory. The influence of characteristic sizes of the quasiparticles on such thermodynamic properties of the quark-gluon plasma like the internal energy and pressure is studied. Sizes of the	Dzhunushaliev, V., Folomeev, V., Ramazanov, T., Kozhamkulov, T. Thermodynamics and statistical physics of quasiparticles within the quark-gluon plasma model (2020) Modern Physics Letters A, 35 (23), статья № 2050194, DOI: 10.1142/S0217732320501941.

			<p>quasiparticles are taken into account in the spirit of the van der Waals equation but we take into consideration that the quasiparticles have different sizes, and the average value of these sizes depends on temperature. It is shown that this results in a change in the internal energy and pressure of the quark-gluon plasma. Also, we show that, when the temperature increases, the average value of characteristic sizes of the quasiparticles increases as well. This leads to the occurrence of a phase transition at the temperature at which the volume occupied by the quasiparticles is compared with the volume occupied by the plasma. © 2020 World Scientific Publishing Company.</p>	
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115.	Model for Investigating the Physical Properties of a System of Charged Particles Taking into Account the External Magnetic Field and Friction Force	DOI10.1134/S2070048220040079 (IF=1.5 ;Q3 in Mathematical Models and Computer Simulations)	<p>Abstract: In the present work, a numerical modified Verlet scheme (MVS) is obtained. This scheme is intended to solve the equations of motion of charged particles immersed in an external stationary environment and a uniform magnetic field, for example, charged particles of a condensed substance in a buffer plasma (dusty plasma).</p> <p>The influence of the environment on the particle dynamics is described by the friction force. The particle dynamics are also affected by interparticle interaction and an external uniform magnetic field. To obtain the Verlet scheme (VS), the coordinates and velocities of the particles are decomposed into a Taylor series, taking into account the Lorentz force and the friction force. All Taylor series expansion terms that give the same order of accuracy are taken into account.</p> <p>In the obtained numerical scheme, the time step of modeling does not depend on the magnitude of the magnetic field but is determined only by the internal physical properties of</p>	Dzhumagulova, K.N., Ramazanov, T.S., Masheyeva, R.U., Jumagulov, M.N. Model for Investigating the Physical Properties of a System of Charged Particles Taking into Account the External Magnetic Field and Friction Force (2020) Mathematical Models and Computer Simulations, 12 (4), pp. 528-535.DOI: 10.1134/S2070048220040079
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			<p>the system under consideration, which is important when modeling an ensemble of charged particles taking electromagnetic fields into account. The paper solves a test problem for which particle trajectories obtained based on the conventional and modified VS for different values, both the friction parameter and the magnetic field parameter, are compared. Based on the analysis of the dependence of the maximum relative deviation of the coordinate on the time step, the time step is independent of the magnetic field in the Taylor expansion scheme, while in the inverse VS it is dependent. © 2020, Pleiades Publishing, Ltd.</p>	
116.	Non-Abelian Proca theories with extra fields: Particlelike and flux tube solutions	DOI10.1088/1402-4896/ab9791 (IF=2.3 ;Q2 in Physica Scripta)	<p>We consider non-Abelian Proca theories with extra fundamental fields included. In the case of SU(2) Proca theory with nonlinear scalar and spinor fields, we obtain spherically symmetric regular solutions describing particlelike configurations with finite energy. For such systems, we find the energy spectrum and show the presence of a mass</p>	<p>Dzhunushaliev, V., Dzhunushaliev, V., Dzhunushaliev, V., Folomeev, V., Folomeev, V., Folomeev, V., Kozhamkulov, T., Makhmudov, A., Ramazanov, T. Non-Abelian Proca theories with extra fields: Particlelike and flux tube solutions (2020) Physica Scripta, 95 (7), статья № 074013, DOI: 10.1088/1402-4896/ab9791</p>

			<p>gap. In the case of SU(3) Proca theory with a nonlinear scalar field, we obtain cylindrically symmetric solutions describing tubes either with the flux of a longitudinal electric field or with the energy flux or with both of them. It is shown that the tubes with the energy flux may contribute considerably to the Proca proton spin. Consistent with all of this, we have argued that non-Abelian Proca theories containing extra fields may approximately describe some phenomena in QCD. © 2020 IOP Publishing Ltd.</p>	
117.	Superhydrophobic carbonous surfaces production by PECVD methods	DOI10.1016/j.apsusc.2020.146050(IF=10.7 ;Q1 in Applied Surface Science)	<p>The paper presents the results of a complex study of superhydrophobic surfaces obtained by PECVD methods in RF discharge plasma with gas mixtures (Ar/CH₄ and Ar/C₂H₂) and by plasma jet (Ar/CH₄). In both experiments hydrophobic surfaces were obtained by deposition of carbon nanoparticles on glass and silicon substrates by plasma of Ar (93%) + CH₄ (7%) and Ar (93%) + C₂H₂ (7%) gas mixtures. To compare surfaces with high hydrophobicity</p>	<p>Orazbayev, S., Zhumadilov, R., Zhunisbekov, A., Gabdullin, M., Yerlanuly, Y., Utegenov, A., Ramazanov, T. Superhydrophobic carbonous surfaces production by PECVD methods (2020) Applied Surface Science, 515, статья № 146050,DOI: 10.1016/j.apsusc.2020.146050</p>

			<p>produced by the above two methods their contact angles were studied. The dependence of changes in the contact angle on the storage time of the samples under normal conditions show that samples obtained in Ar/CH₄ plasma and plasma jet at atmospheric pressure are much better preserved. © 2020</p>	
118.	<p>Ion energy-loss characteristics and friction in a free-electron gas at warm dense matter and nonideal dense plasma conditions</p>	<p>DOI10.1103/PhysRevE.101.053203(IF=4.3 ;Q1 in Physical Review E)</p>	<p>We investigate the energy-loss characteristics of an ion in warm dense matter (WDM) and dense plasmas concentrating on the influence of electronic correlations. The basis for our analysis is a recently developed ab initio quantum Monte Carlo-(QMC) based machine learning representation of the static local field correction (LFC) [Dornheim, J. Chem. Phys. 151, 194104 (2019)JCPA60021-960610.1063/1.5123013], which provides an accurate description of the dynamical density response function of the electron gas at the considered parameters. We focus on the polarization-induced stopping power due to free electrons, the friction function, and the straggling rate. In addition, we compute the</p>	<p>Moldabekov, Z.A., Dornheim, T., Bonitz, M., Ramazanov, T.S. Ion energy-loss characteristics and friction in a free-electron gas at warm dense matter and nonideal dense plasma conditions (2020) Physical Review E, 101 (5), статья № 053203, DOI: 10.1103/PhysRevE.101.053203.</p>

			<p>friction coefficient which constitutes a key quantity for the adequate Langevin dynamics simulation of ions. Considering typical experimental WDM parameters with partially degenerate electrons, we find that the friction coefficient is of the order of $\gamma/\omega_{pi}=0.01$, where ω_{pi} is the ionic plasma frequency. This analysis is performed by comparing QMC-based data to results from the random-phase approximation (RPA), the Mermin dielectric function, and the Singwi-Tosi-Land-Sjölander (STLS) approximation. It is revealed that the widely used relaxation time approximation (Mermin dielectric function) has severe limitations regarding the description of the energy loss of ions in a correlated partially degenerate electrons gas. Moreover, by comparing QMC-based data with the results obtained using STLS, we find that the ion energy-loss properties are not sensitive to the inaccuracy of the static local field correction (LFC) at large wave numbers, $k/k_F > 2$ (with k_F</p>	
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			being the Fermi wave number), but that a correct description of the static LFC at $k/k_F=1.5$ is important. © 2020 American Physical Society.	
119.	Particle formation during deposition of SiO _x nanostructured thin films by atmospheric pressure plasma jet	DOI10.35848/1347-4065/ab72ca (IF=2.7 ;Q2 in Japanese Journal of Applied Physics, Part 1: Regular Papers & Short Notes)	In this work, the results of SiO _x thin film deposition by an atmospheric pressure plasma jet using HMDSO (hexamethyldisiloxane) as precursor are presented. The experiments were performed for different process parameters like initial applied power, substrate to nozzle distance and speed of the moving substrate holder. In order to determine the properties of deposited films the samples were analyzed by scanning electron microscopy, transmission electron microscopy, atomic force microscopy and profilometer. The formation mechanism of particles and their size distribution depending on the process parameters are described and discussed. The results show the possibility to change properties of deposited films and particle formation by tuning the experimental settings. © 2020	Ussenov, Y.A., Hansen, L., Krüger, T., Ramazanov, T.S., Kersten, H. Particle formation during deposition of SiO _x nanostructured thin films by atmospheric pressure plasma jet (2020) Japanese Journal of Applied Physics, 59 (SH), статья № SHHE06, DOI: 10.35848/1347-4065/ab72ca

			The Japan Society of Applied Physics.	
120.	Subdiffusion of dust particles in cryogenic plasmas	DOI 10.7567/1347-4065/ab6565(IF=2.7 ;Q2 in Japanese Journal of Applied Physics, Part 1: Regular Papers & Short Notes)	Neutral shadowing force, which becomes comparable with a screened Coulomb force at extreme cryogenic conditions, can significantly change the properties of complex plasmas. In this work, the impact of neutral shadowing force on the mean square displacement (MSD) of dust particles is investigated. This is done by performing Langevin dynamics simulations of a 2D system of strongly correlated particles. The results of this work show that the additional force due to the neutral shadowing effect has a strong impact on MSD, i.e. the diffusive motion of particles, only if the mean free path of neutral gas particles exceeds the mean inter-dust-particle distance. In the latter case, we find that neutral shadowing force leads to subdiffusion on time scales of the order of tens or hundreds of dust particle plasma oscillation periods. Furthermore, we find that	Aldakulov, Y.Q., Moldabekov, Z.A., Muratov, M., Ramazanov, T.S. Subdiffusion of dust particles in cryogenic plasmas (2020) Japanese Journal of Applied Physics, 59 (SH), статья № SHHE02,DOI: 10.7567/1347-4065/ab6565 .

			neutral shadowing force can strongly hinder the transition from anomalous diffusion to normal diffusion. © 2020 The Japan Society of Applied Physics.	
121.	Dense plasmas with partially degenerate semiclassical ions: Screening and structural properties	DOI10.35848/1347-4065/ab75b5(IF=2.7 ;Q2 in Japanese Journal of Applied Physics, Part 1: Regular Papers & Short Notes	The screened interaction potential between ions taking into account the wave nature of ions is presented. The parameters considered in this paper correspond to those of dense plasmas with ideal or weakly coupled quantum electrons and semiclassical non-ideal ions. The wave nature of ions is described using the concept of quantum potentials. The obtained effective interaction potential between ions takes into account screening by electrons and ionic quantum nonlocality. It is shown that the polarization of electrons around an ion leads to a decrease in the ion's effective thermal wavelength and, conversely, screening of the ion field by electrons becomes weaker due to the wave nature of the ion. Furthermore, on the basis of the derived ion-ion interaction	Ismagambetova, T.N., Moldabekov, Z.A., Amirov, S.M., Ramazanov, T.S., Gabdullin, M.T., Temirbek, A., Tikhonov, A. Dense plasmas with partially degenerate semiclassical ions: Screening and structural properties (2020) Japanese Journal of Applied Physics, 59, статья № SHHA10, DOI: 10.35848/1347-4065/ab75b5.

			<p>potential, we investigate the structural properties of semiclassical non-ideal ions. For hydrogen plasmas, the ionic quantum nonlocality effect is significant at $r S < 0.3$. The obtained results are relevant to high energy density physics. © 2020 The Japan Society of Applied Physics.</p>	
122.	<p>The Memory Effect of Microdischarges in the Barrier Discharge in Airflow</p>	<p>DOI10.1134/S1063780X20040145 (IF=1.8 ;Q3 in Plasma Physics Reports)</p>	<p>Abstract: The paper devoted to the research of the microdischarge dynamics in the dielectric barrier discharge. The discharge between rail electrodes in airflow along the electrodes at atmospheric pressure was studied. The aim of this work is to clarify the role of volume plasma and surface charges in the memory effect of microdischarges. Based on the analysis of microdischarge images obtained using high-speed camera, it is established that the transport of microdischarge plasma by a gas flow determines the microdischarge localization in each subsequent half-cycle of the applied voltage. An important part is played by the turbulence and the presence of</p>	<p>Usenov, E.A., Akishev, Y.S., Petryakov, A.V., Ramazanov, T.S., Gabdullin, M.T., Ashirbek, A., Akil'dinova, A.K. The Memory Effect of Microdischarges in the Barrier Discharge in Airflow (2020) Plasma Physics Reports, 46 (4), pp. 459-464. DOI: 10.1134/S1063780X20040145</p>

			<p>vortices in the airflow. They determine both the speed of plasma channel transfer and the probability of the microdischarge appearance in a specific half-cycle. The results of the work show the possibility of the gas-dynamic control for parameters of a barrier discharge. © 2020, Pleiades Publishing, Ltd.</p>	
123.	<p>Obtaining of carbon nanowalls in the plasma of radio-frequency discharge</p>	<p>DOI 10.1016/j.apsusc.2019.144119(IF=10.7 ;Q1 in Applied Surface Science)</p>	<p>In this work a synthesis of carbon nanowalls (CNWs) in the plasma of argon and methane gases of capacitively coupled radio-frequency (CCRF) discharge is considered. The carbon nanowalls were synthesized by plasma enhanced chemical vapor deposition method at relatively lower values of discharge power and gas flow rate for low-cost CNWs production. The growth process of carbon nanowalls was studied at different synthesis parameters. The morphology and structure quality of obtained samples were investigated by Raman spectroscopy, scanning electron and atomic force microscopies. It was found, that at a lower value of RF power the formation</p>	<p>Batryshev, D., Yerlanuly, Y., Alpysbaeva, B., Nemkaeva, R., Ramazanov, T., Gabdullin, M. Obtaining of carbon nanowalls in the plasma of radio-frequency discharge (2020) Applied Surface Science, 503, статья № 144119, DOI: 10.1016/j.apsusc.2019.144119</p>

			<p>of CNWs goes better with increasing methane flow rate and further increasing RF power leads to agglomeration of nanowalls and formation of nanoclusters, which then transfer into multilayered graphene. Thus, on the basis of obtained results, a process map with different zones of deposited carbon nanostructures is developed. © 2019 Elsevier B.V.</p>	
124.	Thin-film deposition by combining plasma jet with spark discharge source at atmospheric pressure	DOI 10.1002/ctpp.202000140(I F=2.1 ;Q2 in Contributions to Plasma Physics)	<p>This study demonstrates a method for the deposition of CuOx thin films by combining atmospheric pressure plasma jet with spark discharge. In this type of discharge source, the bulk copper material of spark discharge electrodes plays the role of a precursor. Copper atoms and particles go through the physical processes of sputtering, evaporation, and further agglomeration and condensation in the plasma jet and on the substrate. The experiments were carried out with and without a combination of discharges. The material coated on the substrate was studied using a scanning</p>	<p>Ussenov, Y.A., Toktamyssova, M.T., Dosbolayev, M.K., Gabdullin, M.T., Daniyarov, T.T., Ramazanov, T.S. Thin-film deposition by combining plasma jet with spark discharge source at atmospheric pressure (2021) Contributions to Plasma Physics, 61 (3), статья № e202000140,DOI: 10.1002/ctpp.202000140 .</p>

			<p>electron microscope, Raman spectroscopy, and energy-dispersive X-ray spectroscopy. The characteristics of the set-up and plasma, such as I-V curves, optical emission spectra, and substrate temperature, were also measured. Copper electrodes were examined for erosion by a scanning electron microscope. The results demonstrate that deposits coated by combined discharge show denser and thicker films. © 2020 Wiley-VCH GmbH</p>	
125.	Organic Resist Contrast Determination in Ion Beam Lithography	DOI 10.1134/S1063782620140262(IF=1.3;Q4 in Semiconductors)	<p>Abstract: The feature of the promising tool of lithographic nanostructuring based on selective exposure of polymer resist by ion beam is very compact (of about tens of nanometers) beam interaction volume. Herewith the main part of beam energy is deposited in the resist and is spent to its modification. It causes the set of advantages specific for this method: sub-10 nanometer resolution achievable, very high energy efficiency and almost complete absence of proximity effect. But also due to this feature absorbed doze essentially</p>	<p>Shabelnikova, Y.L., Zaitsev, S.I., Gusseinov, N., Gabdullin, M., Muratov, M.M. Organic Resist Contrast Determination in Ion Beam Lithography (2020) Semiconductors, 54 (14), pp. 1854-1857.DOI: 10.1134/S1063782620140262</p>

			<p>inhomogeneous in resist and the dissolution rate is strongly dependent on depth. So the common procedure of resist contrast determination cannot be applied anymore. In the present work a new method for resist contrast determination considering the relation between dissolution rate and deposited energy density is suggested and realized. By using it for PMMA resist irradiated by 30 keV Ga⁺ ion beam the value of contrast was determined to be 3.1 and ions energy length was estimated to be 42 nm. © 2020, Pleiades Publishing, Ltd.</p>	
126.	Electrolytic capacitor life time calculation under varying operating conditions	DOI 10.21595/jve.2019.20733(I F=1.7 ;Q3 in Journal of Vibroengineering)	<p>A fair evaluation of an electrolytic capacitor time to failure is important for the design and development of electronic devices. In practice, it is required to consider variable operating conditions, for example, weather temperature fluctuations or load variations.</p> <p>Based on the principle of Miner's fatigue accumulation and reasonable approximations, the general formulas are derived that take into account weather temperature changes. The</p>	<p>Dzhunusbekov, E.J., Orazbayev, S.A. Electrolytic capacitor life time calculation under varying operating conditions (2020) Journal of Vibroengineering, 22 (3), pp. 721-734. DOI: 10.21595/jve.2019.20733</p>

			<p>outdoor air temperature was modeled by the sum of components like averaged seasonal changes, averaged daily temperature changes and random temperature fluctuations. An Easy-to-use analytical formulas for the electrolytic capacitor life time estimation were obtained, in which the contribution of each individual temperature phenomenon can be evaluated. The impact of these components on the non-linear estimation formula by the Miner's principle has been clarified for some example climatic regions. Also, the capacitor life time estimation formula under particularly scheduled variable load was derived for example. The resulting formulas are useful for engineering calculations of the reliability of electronic devices exposed to weather temperature changes. © 2020 Erlan J. Dzhunusbekov, et al.</p>	
127.	Experimental investigation of the distribution of energy deposited by	DOI: 10.21272/jnep.12(4).04038 (IF=1,1; Q3 in Journal of Nano- and Electronic Physics)	The first and rigorous sensitivity comparison of the most used positive-tone resist (PMMA 950K) exposure to both electrons and gallium ions in a wide range of exposure doses at	Muratov, M., Myrzabekova, M., Guseinov, N., Nemkayeva, R., Ismailov, D., Shabelnikova, Y., Zaitsev, S. Experimental investigation of the distribution of energy deposited by FIB in ion-beam lithography

	FIB in ion-beam lithography		<p>the same beam energy was carried out. It was found that the PMMA 950K resist has a positive sensitivity of $0.15 \mu\text{C}/\text{cm}^2$, which is about three orders of magnitude more sensitive to gallium ions than to electrons, all at the same conditions. At high Ga exposure doses, as well as with electron exposure, negative sensitivity is observed. The depth of the resist after etching in a solvent depending on the exposure dose was also studied, and based on this an analytical model using the absorbed energy density in the form of a displaced Gaussian, that allows one to restore the resist contrast and the energy length from experimental data, was proposed. The model accurately describes the both experimental and simulation results. It was shown that the contrast for the PMMA 950K resist is $\gamma \sim 3.1$ for the energies of gallium ions and the energy length is $L_e = 43 \text{ nm}$.</p>	<p>(2020) Journal of Nano- and Electronic Physics, 12 (4), статья № 04038, . DOI: 10.21272/jnep.12(4).04038</p>
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128.	Ab initio results for the plasmon dispersion and damping of the warm dense electron gas	DOI: 10.1002/ctpp.202000147 (IF=2,1; Q3 in Contributions to Plasma Physics)	<p>Warm dense matter (WDM) is an exotic state on the border between condensed matter and dense plasmas. Important occurrences of WDM include dense astrophysical objects, matter in the core of our Earth, and matter produced in strong compression experiments. As of late, x-ray Thomson scattering has become an advanced tool to diagnose WDM. The interpretation of the data requires model input for the dynamic structure factor $S(q, \omega)$ and the plasmon dispersion $\omega(q)$.</p> <p>Recently, the first ab initio results for $S(q, \omega)$ of the homogeneous warm dense electron gas were obtained from path integral Monte Carlo simulations (Dornheim et al., Phys. Rev. Lett., 121, 255001, 2018). Here, we analyse the effects of correlations and finite temperature on the dynamic dielectric function and the plasmon dispersion. Our results for the plasmon dispersion and damping differ significantly from the random-phase approximation and from earlier models of the correlated electron</p>	<p>Hamann, P., Vorberger, J., Dornheim, T., Moldabekov, Z.A., Bonitz, M.</p> <p>Ab initio results for the plasmon dispersion and damping of the warm dense electron gas (2020) Contributions to Plasma Physics, 60 (10), статья № e202000147, . DOI: 10.1002/ctpp.202000147</p>
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			<p>gas. Moreover, we show when commonly used weak damping approximations break down and how the method of complex zeroes of the dielectric function can solve this problem for WDM conditions.</p>	
129.	<p>Oblique magnetic field influence on the wakefield in complex plasmas</p>	<p>DOI: 10.1088/1361-6587/aba992 (IF=5,1; Q1 in Plasma Physics and Controlled Fusion)</p>	<p>The results of an investigation of the wakefield around a stationary charged grain in an external magnetic field with non-zero transverse component with respect to the ion flow direction is presented. In contrast to the previously reported significant suppression of the wake oscillations due to the magnetic field applied along the flow, the wake potential exhibits long range recurrent oscillations in the presence a of transverse flow to the magnetic field. Extensive analysis for a wide range of parameters elucidate a strong dependence of the wake on the orientation of the magnetic field in the sonic and supersonic regimes by manifesting sensitivity to even a meager deviation of magnetic field from the longitudinal direction. The impact of the</p>	<p>Sundar, S., Moldabekov, Z.A. Oblique magnetic field influence on the wakefield in complex plasmas (2020) Plasma Physics and Controlled Fusion, 62 (10), статья № 105018, . DOI: 10.1088/1361-6587/aba992</p>

			<p>orientation and strength of magnetic field on the wake behavior is assessed. The deviation of the magnetic field induction vector from the longitudinal to ion flux direction leads to the wakefield with two positive peaks split in the transverse to ion flow direction in the downstream region; similar to that of the ultracold ions wake without magnetic field [(2020) New J. Phys. 22 033028].</p>	
130.	<p>Morphological, Structural, and Optical Properties of Silicon Nanostructures Formed in a Solution Containing Hydrogen Hexafluorosilicate H₂(SiF₆)</p>	<p>DOI 10.1134/S0030400X20090234(IF=1.5; Q3 in Optics and Spectroscopy (English translation of Optika i Spektroskopiya))</p>	<p>Abstract: Photoluminescent boron-doped (100)-oriented porous silicon fabricated on a p-type silicon substrate by electrochemical etching in a solution containing fluorosilicic acid and ethanol is studied. The morphological, structural, and optical properties of silicon nanostructures obtained in solutions containing H₂(SiF₆) and ethanol are analyzed in comparison with the corresponding characteristics of samples formed in solutions of HF and ethanol. The morphological, structural, and optical properties were studied using scanning probe</p>	<p>Zhumatova, S.A., Manakov, S.M., Sagidolda, Y., Darmenkulova, M.B., Azamat, R.M., Alpysbaeva, B.Y., Dikhanbaev, K.K. Morphological, Structural, and Optical Properties of Silicon Nanostructures Formed in a Solution Containing Hydrogen Hexafluorosilicate H₂(SiF₆) (2020) Optics and Spectroscopy, 128 (9), pp. 1487-1491. DOI: 10.1134/S0030400X20090234</p>

			<p>microscopy and spectrophotometry. It is shown that the porous silicon samples formed in solutions containing H₂(SiF₆) and ethanol have better optical properties, in particular, they exhibit more intense photoluminescence than the samples obtained in HF-ethanol solutions. © 2020, Pleiades Publishing, Ltd.</p>	
131.	<p>Dynamic properties of the warm dense electron gas based on ab initio path integral Monte Carlo simulations DYNAMIC PROPERTIES of the WARM DENSE ELECTRON ... PAUL HAMANN et al.</p>	<p>DOI: 10.1103/PhysRevB.102.125150 (IF=6,5; Q1 in Physical Review B)</p>	<p>There is growing interest in warm dense matter (WDM), an exotic state on the border between condensed matter and plasmas. Due to the simultaneous importance of quantum and correlation effects, WDM is complicated to treat theoretically. A key role has been played by ab initio path integral Monte Carlo (PIMC) simulations, and recently extensive results for thermodynamic quantities have been obtained. The first extension of PIMC simulations to the dynamic structure factor of the uniform electron gas was reported by Dornheim et al. [Phys. Rev. Lett. 121, 255001 (2018)PRLTAO0031-900710.1103/PhysRevLett.121.2</p>	<p>Hamann, P., Dornheim, T., Vorberger, J., Moldabekov, Z.A., Bonitz, M. Dynamic properties of the warm dense electron gas based on ab initio path integral Monte Carlo simulations DYNAMIC PROPERTIES of the WARM DENSE ELECTRON ... PAUL HAMANN et al. (2020) Physical Review B, 102 (12), статья № 125150, . DOI: 10.1103/PhysRevB.102.125150</p>

			55001]. This was based on an accurate reconstruction of the dynamic local field correction. Here we extend this concept to other dynamical quantities of the warm dense electron gas including the dynamic susceptibility, the dielectric function, and the conductivity.	
132.	Ab initio path integral monte carlo simulation of the uniform electron gas in the high energy density regime	DOI: 10.1088/1361-6587/ab8bb4 (IF=5,1; Q1 in Plasma Physics and Controlled Fusion)	The response of the uniform electron gas (UEG) to an external perturbation is of paramount importance for many applications. Recently, highly accurate results for the static density response function and the corresponding local field correction have been provided both for warm dense matter [2019 J. Chem. Phys. 151 194104] and strongly coupled electron liquid [2020 Phys. Rev. B 101 045129] conditions based on exact ab initio path integral Monte Carlo (PIMC) simulations. In the present work, we further complete our current description of the UEG by exploring the high energy density regime, which is relevant for, e.g. astrophysical	Dornheim, T., Moldabekov, Z.A., Vorberger, J., Groth, S. Ab initio path integral monte carlo simulation of the uniform electron gas in the high energy density regime (2020) Plasma Physics and Controlled Fusion, 62 (7), статья № 075003, .DOI: 10.1088/1361-6587/ab8bb4

			<p>applications and inertial confinement fusion experiments.</p> <p>To this end, we present extensive new PIMC results for the static density response in the range of $0.05 \leq r \leq 0.5$ and $0.85 \leq \theta \leq 8$. These data are subsequently used to benchmark the accuracy of the widely used random phase approximation and the dielectric theory by Singwi, Tosi, Land, and Sjölander (STLS). Moreover, we compare our results to configuration PIMC data where they are available and find perfect agreement with a relative accuracy of 0.001-0.01%. All PIMC data are available online.</p>	
133.	Effect of Preliminary Aluminum Annealing on the Microstructure of Anodized Aluminum Oxide Films	DOI 10.1109/EIConRus49466.2020.9038973	<p>The article focuses on the technology of preliminary preparation of the aluminum foil surface with a thickness of 50 μm and the actual process of electrochemical anodizing. The research stage was the restructuring of the foil surface during thermal annealing. It was found that homogenization annealing increases the uniformity of the structure and chemical composition of the material. The morphology and</p>	<p>Batalova, M.S., Alpysbayeva, B.E., Korobova, N.E. Effect of Preliminary Aluminum Annealing on the Microstructure of Anodized Aluminum Oxide Films (2020) Proceedings of the 2020 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering, EIConRus 2020, статья № 9038973, pp. 2115-2118. DOI: 10.1109/EIConRus49466.2020.9038973</p>

			<p>crystal structure of the anodized oxide were examined by transmission electron microscopy. The effect of heat-treatment before aluminum foil anodization on the microstructure of anodized aluminum oxide films has been found. © 2020 IEEE.</p>	
134.	<p>Ab initio simulation of warm dense matter</p>	<p>DOI 10.1063/1.5143225 (IF=3,9; Q2 in Physics of Plasmas)</p>	<p>Warm dense matter (WDM) - an exotic state of highly compressed matter - has attracted increased interest in recent years in astrophysics and for dense laboratory systems. At the same time, this state is extremely difficult to treat theoretically. This is due to the simultaneous appearance of quantum degeneracy, Coulomb correlations, and thermal effects, as well as the overlap of plasma and condensed phases. Recent breakthroughs are due to the successful application of density functional theory (DFT) methods which, however, often lack the necessary accuracy and predictive capability for WDM applications. The situation has changed with the availability of the first ab initio data for the exchange-correlation free energy</p>	<p>Bonitz, M., Dornheim, T., Moldabekov, Z.A., Zhang, S., Hamann, P., Kählert, H., Filinov, A., Ramakrishna, K., Vorberger, J. Ab initio simulation of warm dense matter (2020) Physics of Plasmas, 27 (4), статья № 042710, . DOI: 10.1063/1.5143225</p>

			<p>of the warm dense uniform electron gas (UEG) that were obtained by quantum Monte Carlo (QMC) simulations; for recent reviews, see Dornheim et al., Phys. Plasmas 24, 056303 (2017) and Phys. Rep. 744, 1-86 (2018). In the present article, we review recent further progress in QMC simulations of the warm dense UEG: namely, ab initio results for the static local field correction $G(q)$ and for the dynamic structure factor $S(q, \omega)$. These data are of key relevance for comparison with x-ray scattering experiments at free electron laser facilities and for the improvement of theoretical models. In the second part of this paper, we discuss the simulations of WDM out of equilibrium. The theoretical approaches include Born-Oppenheimer molecular dynamics, quantum kinetic theory, time-dependent DFT, and hydrodynamics. Here, we analyze the strengths and limitations of these methods and argue that progress in WDM simulations will require a suitable combination of all</p>	
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			<p>methods. A particular role might be played by quantum hydrodynamics, and we concentrate on problems, recent progress, and possible improvements of this method.</p>	
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135.	Ultracold ions wake in dusty plasmas	DOI 10.1088/1367-2630/ab7bd2 (IF=6,1; Q1 in New Journal of Physics)	<p>Motivated by the recent experimental realization of ultracold dusty plasma (2019 Sci. Rep. 9 3261), we present the results of particle-in-cell simulation with Monte-Carlo-collisions for wake behind a dust particle due to focusing of ions at superfluid helium temperature (2 K). Dynamical screening (wakefield) defines structural and dynamical properties of charged dust particles in plasmas such as phase transition, crystal formation, vibration modes (waves) etc. Here, we delineate in detail the dependence of wake strength on the streaming velocity of ions and on the ion-neutral charge exchange collision frequency (neutrals density) in the ultracold dusty plasma. Lowering the temperature to ultracold level leads to a wake pattern behind a dust particle that completely differs from the wake at normal conditions. For wide range of parameters, most remarkable features of the wakefield are (i) the formation of wake pattern with two maxima split in transverse to ion flow direction</p>	<p>Sundar, S., Moldabekov, Z.A. Ultracold ions wake in dusty plasmas (2020) New Journal of Physics, 22 (3), статья № 033028, . DOI: 10.1088/1367-2630/ab7bd2</p>
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			<p>in the downstream area, (ii) pronounced inverse V shape of the wakefield closely resembling the wake in quark-gluon plasma and dense quantum plasma (warm dense matter), and (iii) the inter-dust attraction region in transverse direction. The latter shows that molecule-like interaction between dust particles is realized in ultracold dusty plasmas. These observations show a fundamental difference of ultracold dusty plasma physics from well studied complex plasmas at normal conditions.</p>	
136.	Plasma-grain interaction in ultracold complex plasmas	DOI 10.1063/1.5135352 (IF=3,9; Q2 in Physics of Plasmas)	<p>The present particle-in-cell simulation for grain-plasma interaction at cryogenic temperatures springs from recent experimental realization of ultracold dusty plasmas with atoms and ions at superfluid helium temperatures. In this work, we discuss the results of particle-in-cell simulations (taking into account ion-atom collisions) for dust particle charge, ion drag force, and interaction between grains in ultracold dusty plasmas. The</p>	<p>Sundar, S., Moldabekov, Z.A. Plasma-grain interaction in ultracold complex plasmas (2020) Physics of Plasmas, 27 (3), статья № 033701, . DOI: 10.1063/1.5135352</p>

			<p>single grain as well as two grain system is investigated, considering both streaming ions and equilibrium ions. The dependence of plasma mediated inter-grain interactions on the streaming velocity of ions and inter-particle separation is delineated in detail.</p> <p>Additionally, ion density distribution around grains is discussed. The interactions at cryogenic temperatures are distinct from those at room temperature by their differences in magnitude and interaction mechanism details. Most remarkable features are (i) the inter-grain attraction in equilibrium plasmas due to plasma absorption on the surface of grains, (ii) the ion drag force directed against ion streaming velocity in the case of a single dust particle, and (iii) non-linear response of the plasma polarization around grains with an increase in the streaming velocity of ions.</p>	
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137.	Plasma Diagnostics on Pulse Plasma-Focus Generators and Their Features as Alternative Fusion Reactors	DOI10.1080/15361055.2021.1916273 (IF=2.2 ;Q2 in Fusion Science and Technology)	<p>This paper is devoted to discussing the technical characteristics of pulsed plasma-focus (PF) generators and their features as fusion reactors as an alternative for stationary thermonuclear installations. First, the authors present results of experimental data obtained on the Pulse Plasma Accelerator-30 (PPA-30) and dense PF-4 devices. The pulse discharge current and jumped parameters and the energy distribution along and across the axis on the 31-kJ (at 30 kV and 69 μF) PPA-30 device were determined. It is indicated that plasma already is completely ionized at the kilo-ampere range and its inductance is small. The maximum energy density of the plasma was equal to 230 J/cm² and a macrofocusing effect was observed. Second, the emission parameters of the PF-4 device were determinate. The neutron yield was equal to about 107 imp/shot. The variation of the axial and radial neutron yield was observed. Further, the problems of neutron yield on PF devices and options for the</p>	<p>Zhukeshov, A.M., Moldabekov, Z.M., Ibraev, B.M., Amrenova, A.U., Gabdullina, A.T. Plasma Diagnostics on Pulse Plasma-Focus Generators and Their Features as Alternative Fusion Reactors (2021) Fusion Science and Technology, 77 (5), pp. 359-365. DOI: 10.1080/15361055.2021.1916273</p>
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			<p>development of a fusion reactor taking into account other technical capabilities of PF are discussed. It is proposed to develop the design of PF in such a way as to take into account the peculiarities of the interaction of particles with an electric and magnetic field. In this situation, the important indicator is not the temperature of the plasma, but the geometry of the electrode system to provide a directed flow of particles. © 2021 American Nuclear Society.</p>	
138.	<p>Plasma with carbon nanoparticles : Advances and application</p>	<p>DOI 10.1088/1361-6528/ac1a40 (IF=5,8; Q1 in Nanotechnology)</p>	<p>This article is devoted to the study of the glow intensity of radio-frequency capacitive discharge plasma with nanoparticles for further use in lighting devices. The process of carbon nanoparticles synthesis in the radiofrequency discharge was investigated, and the influence of plasma parameters on the formation and growth of the material was also studied. A method for determining the diameter of nanoparticles based</p>	<p>Orazbayev, S., Yerlanuly, Y., Utegenov, A., Moldabekov, Z., Gabdullin, M., Ramazanov, T. Plasma with carbon nanoparticles: Advances and application (2021) Nanotechnology, 32 (45), статья № 455602, . DOI: 10.1088/1361-6528/ac1a40</p>

			<p>on self-bias voltage and electron density is considered. It is revealed that the diameter of nanoparticles has a considerable influence on the optical properties of the plasma, in particular, on the emission intensity. Based on the obtained data, laboratory samples of lighting devices with improved luminous intensities were developed.</p>	
139.	<p>Ion core effect on scattering processes in dense plasmas</p>	<p>DOI 10.1063/5.0059297 (IF=3,9; Q2 in Physics of Plasmas)</p>	<p>A pseudopotential approach was used to study the effect of an ionic core on the electron-ion scattering in dense plasmas. Screening of the ion charge is taken into account using the density response function in the long wavelength limit. Additionally, the effect of electronic non-ideality is included using the compressibility sum-rule connecting the local field correction and the exchange-correlation part of the electronic free energy density. Using a screened pseudopotential, we have computed electron-ion scattering phase shifts, the total elastic scattering cross section, and the transport cross section. It</p>	<p>Ramazanov, T.S., Kodanova, S.K., Nurusheva, M.M., Issanova, M.K. Ion core effect on scattering processes in dense plasmas (2021) Physics of Plasmas, 28 (9), статья № 092702, . DOI: 10.1063/5.0059297</p>

			<p>is found that the ionic core leads to the strong decrease in the scattering cross sections. Additionally, it is shown that the transport cross section has a non-monotonic dependence on the variation of the ionic core field parameters.</p>	
140.	<p>Hydrogen sorption properties of new magnesium intermetallic compounds with MgSnCu₄ type structure</p>	<p>DOI 10.1016/j.ijhydene.2021.05.069 (IF=9,0; Q1 in International Journal of Hydrogen Energy)</p>	<p>A statistical theory of the MgCeCo₄-H₂ system has been developed for hydrogenation and phase transitions under pressure. The free energy value is calculated. The equation of thermodynamic equilibrium is obtained. The temperature of the order-disorder phase transition is estimated. Isotherms and Isoplethes of hydrogen absorption-desorption are constructed. The possibility of a hysteresis effect is established. The temperature dependence of the hydrogen solubility is found taking into account the phase transition configuration heat capacity. The calculated and experimental graphs of the sorption isotherm are of a similar nature.</p>	<p>Matysina, Z.A., Gavrylyuk, N.A., Kartel, M., Veziroglu, A., Veziroglu, T.N., Pomytkin, A.P., Schur, D.V., Ramazanov, T.S., Gabdullin, M.T., Zolotarenko, A.D., Zolotarenko, A.D., Shvachko, N.A. Hydrogen sorption properties of new magnesium intermetallic compounds with MgSnCu₄ type structure (2021) International Journal of Hydrogen Energy, 46 (50), pp. 25520-25532 DOI: 10.1016/j.ijhydene.2021.05.069</p>

141.	Rotation of dust particles in an inhomogeneous weak magnetic field in a DC glow discharge	DOI 10.1063/5.0052905 (IF=3,9; Q2 in Physics of Plasmas)	<p>We report an explanation for the opposite direction of the rotation of the charged dust particles above and below the Helmholtz coil in an inhomogeneous weak magnetic field in the direct current glow discharge.</p> <p>Experiments with monodispersed melamine-formaldehyde particles were performed in an argon plasma in an inhomogeneous weak magnetic field (with the induction values 4, 12, and 18). The linear and angular velocities of rotational motion of the clusters of dust particles formed in regions with an inhomogeneous weak magnetic field above and below the Helmholtz coil were analyzed.</p> <p>The peculiarity is that the directions of rotation in these areas are opposite, whereas there is no rotational motion in the region of a uniform magnetic field. To explain these observations, the theoretical model that takes into account the magnetic field inhomogeneity and provides good agreement with experimental data is presented. © 2021 Author(s).</p>	<p>Abdirakhmanov, A.R., Bastykova, N.K., Kodanova, S.K., Ramazanov, T.S.</p> <p>Rotation of dust particles in an inhomogeneous weak magnetic field in a DC glow discharge (2021) Physics of Plasmas, 28 (7), статья № 074503, . DOI: 10.1063/5.0052905</p>
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142.	The study of deuterium permeability of film-forming inhibitors with the addition of fullerenes	DOI 10.1016/j.ijhydene.2020.11.241 (IF=9,0; Q1 in International Journal of Hydrogen Energy)	In this work, the results of the hydrogen permeability study of a composite film-forming inhibitor are considered. Film-forming inhibitor consists of polyether urethane and synthesized fullerenes C60 and C70 in pure form. Two types of samples were used: uncoated and coated stainless steels with composite polyether urethane/fullerene varnish. The experimental work was based on the study of the dependence of the permeation reduction factor on the temperature in the reactor. For the coated sample, the minimum temperature was 623 K at which the deuterium flux was registered. Here we assume that at temperatures below 573 K the output pressure caused by the deuterium flow through the sample is less than 10–10 Pa. The rate of steady-state flow through a coated sample is significantly lower than for an uncoated one at temperatures 573–673 K. The deuterium penetration rates through the two samples increase and reach similar	Akhanova, N., Yerlanuly, Y., Batryshev, D., Kulsartov, T., Chikhray, Y., Ramazanov, T., Veziroglu, A., Schur, D., Kang, W., Gabdullin, M. The study of deuterium permeability of film-forming inhibitors with the addition of fullerenes (2021) International Journal of Hydrogen Energy, 46 (10), pp. 7426-7431. DOI: 10.1016/j.ijhydene.2020.11.241
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			stationary values starting at 723 K.	
143.	Methods of theoretical calculations and of experimental researches of the system atomic hydrogen – metal	DOI 10.1016/j.ijhydene.2021.03.065 (IF=9,0; Q1 in International Journal of Hydrogen Energy)	All the main directions of energy development suggest or already implement the use of hydrogen. In addition, the interaction of low-energy hydrogen atoms with metals is also of considerable interest, both from the point of view of fundamental research and in connection with the operation of large tokamaks and thermonuclear reactors. The paper presents a literature review of the features of the interaction of hydrogen with metals. It is shown that metal-hydrogen reactions, which lead to the formation of metal hydrides, are considered as a special type of such interaction. Modern methods of	Zolotareno, A.D., Zolotareno, A.D., Veziroglu, A., Veziroglu, T.N., Shvachko, N.A., Pomytkin, A.P., Schur, D.V., Gavrylyuk, N.A., Ramazanov, T.S., Akhanova, N.Y., Gabdullin, M.T. Methods of theoretical calculations and of experimental researches of the system atomic hydrogen – metal (2021) International Journal of Hydrogen Energy, . DOI: 10.1016/j.ijhydene.2021.03.065

			<p>experimental study of heterogeneous reactions, topochemistry of metal - hydrogen reactions, dependences of the rate of interaction on pressure and temperature are considered, models of surface processes occurring during the interaction of hydrogen with a metal are discussed. A kinetic method for studying the mechanism of interaction of atomic hydrogen with hydride-forming metals is proposed.</p>	
144.	<p>The use of ultrapure molecular hydrogen enriched with atomic hydrogen in apparatuses of artificial lung ventilation in the fight against virus COVID-19</p>	<p>DOI 10.1016/j.ijhydene.2021.03.025 (IF=9,0; Q1 in International Journal of Hydrogen Energy)</p>	<p>COVID-19 is a disease caused by the SARS-CoV virus. It stands for severe acute respiratory syndrome, which affects the lungs. The process of replication and progression of the COVID-19 virus causes the formation of an excessive amount of reactive oxygen species and inflammation. Many studies have been carried out that have demonstrated that hydrogen has strong anti-inflammatory properties. It reduces hypotension and other symptoms by reducing inflammation and oxidative stress. Oxygen mixture, enriched with Hydrogen, - helps to reduce</p>	<p>Zolotarenko, A.D., Zolotarenko, A.D., Veziroglu, A., Veziroglu, T.N., Shvachko, N.A., Pomytkin, A.P., Gavrylyuk, N.A., Schur, D.V., Ramazanov, T.S., Gabdullin, M.T. The use of ultrapure molecular hydrogen enriched with atomic hydrogen in apparatuses of artificial lung ventilation in the fight against virus COVID-19 (2021) International Journal of Hydrogen Energy, . DOI: 10.1016/j.ijhydene.2021.03.025</p>

the resistance of the respiratory tract and frees up access to the pulmonary alveolus, which improves the penetration of oxygen into the lungs. Since hydrogen is an antioxidant, it helps to reduce the burden on the immune system, helps to maintain the body's health and its ability to quickly recover. When electrolyzers are used to produce an oxygen-hydrogen mixture, alkaline mist and other impurities can enter the patient's lungs and cause poisoning and chemical burns. For this reason, the use of atomic hydrogen obtained from metal hydride sources for ventilation of the lungs will be more effective for treating COVID-19 than a molecular hydrogen-oxygen mixture from an electrolyzer. A functional diagram of a metal hydride source of atomic hydrogen to an artificial lung ventilator is shown. It is possible to create a series of hydrogen storage tanks of various capacities.

145.	Investigation of the Evolution of Be, Ni, Mo, and W Dust Grains in Fusion Plasma	DOI 10.1134/S1063780X21010049 (IF=1,8; Q3 in Plasma Physics Reports)	<p>In this work, evolution of dust grains from different materials used in fusion energy installations was studied and a model was constructed that describes the generation of dust. The model accounts for the thermochemical, electrical, and other properties of the materials of the fusion reactor wall. It was shown that the dominant process that leads to the decrease in dust grain mass is the thermal evaporation, which is determined by the saturated vapor pressure at thermal equilibrium temperature. Estimates of the lifetime of dust grains from different materials were obtained depending on plasma parameters. The findings of this work can be useful for estimates of the length of penetration of dust grains into the reactor. The difference in the dynamics of particles from light and heavy elements was shown. Out of the four elements under study (Be, Ni, Mo, and W), nickel grains demonstrate the highest penetrating ability due to their long lifetime and moderate weight.</p>	<p>Bastykova, N.K., Golyatina, R.I., Kodanova, S.K., Ramazanov, T.S., Maiorov, S.A. Investigation of the Evolution of Be, Ni, Mo, and W Dust Grains in Fusion Plasma (2021) Plasma Physics Reports, 47 (1), pp. 92-95. DOI: 10.1134/S1063780X21010049</p>
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146.	Dust-Acoustic Wave Dispersion in Thermal Dusty Plasmas at Weak and Moderate Couplings	DOI 10.1109/TPS.2021.3078344 (IF=2,4; Q2 in IEEE Transactions on Plasma Science)	The dispersion of dust-acoustic waves (DAWs) in weakly and moderately coupled thermal dusty plasmas is studied in the framework of the linear density-response formalism with the static local-field correction for interdust interactions. The plasma medium composition and the charge of dust particles are simultaneously determined within a recently developed chemical model (Physical Review E, vol. 101, 063203, 2020) based on minimizing the Helmholtz free energy of the system under investigation. Stemming from the generalized Poisson-Boltzmann equation, the renormalization procedure is consistently applied to derive an interdust screened potential that takes into account the finiteness of dust grains. Within the framework of the Ornstein-Zernike relationship in the hypernetted chain approximation, the static structure factor of the dust component is evaluated to manifest the appearance of local extrema on its wavenumber dependence, thereby indicating	Davletov, A., Kurbanov, F., Mukhametkarimov, Y., Yerimbetova, L. Dust-Acoustic Wave Dispersion in Thermal Dusty Plasmas at Weak and Moderate Couplings (2021) IEEE Transactions on Plasma Science, 49 (6), статья № 9439058, pp. 2000-2007. DOI 10.1109/TPS.2021.3078344
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			<p>the short-range order formation in the arrangement of dust particles with respect to one another. It is shown that the DAW dispersion law is completely governed by the static structure factor and, therefore, exhibits a nonmonotonic dependence on the wavenumber as well. In the long-wavelength limit, the acoustic-like behavior of the DAW dispersion is strictly confirmed and the corresponding phase speed, reduced in units of the dust thermal velocity, is ultimately expressed via the static structure factor at zero wavenumber.</p>	
147.	Self-bias voltage formation and charged particle dynamics in multi-frequency capacitively coupled plasmas	DOI 10.1063/5.0055444 (IF=2,6; Q2 in AIP Advances)	In this work, we analyze the creation of the discharge asymmetry and the concomitant formation of the DC self-bias voltage in capacitively coupled radio frequency plasmas driven by multi-frequency waveforms as a function of the electrode surface characteristics. For the latter, we consider and vary the coefficients that characterize the elastic reflection of electrons from the surfaces and the ion-induced secondary electron	Masheyeva, R.U., Dzhumagulova, K.N., Myrzaly, M., Schulze, J., Donkó, Z. Self-bias voltage formation and charged particle dynamics in multi-frequency capacitively coupled plasmas (2021) AIP Advances, 11 (7), статья № 075024, . DOI: 10.1063/5.0055444

		<p>yield. Our investigations are based on particle-in-cell/Monte Carlo collision simulations of the plasma and on a model that aids the understanding of the computational results. Electron reflection from the electrodes is found to slightly affect the discharge asymmetry in the presence of multi-frequency excitation, whereas secondary electrons cause distinct changes to the asymmetry of the plasma as a function of the phase angle between the harmonics of the driving voltage waveform and as a function the number of these harmonics.</p>	
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148.	Insights on Desired Fabrication Factors from Modeling Sandwich and Quasi-Interdigitated Back-Contact Perovskite Solar Cells	DOI 10.1021/acsaem.0c02120 (IF=5,4; Q1 in ACS Applied Energy Materials)	A numerical simulation method is used to investigate the optical and electrical properties of both conventional sandwich and quasi-interdigitated back-contact (QIBC) perovskite solar cells (PSCs). The results reveal the fundamental physics of PSCs with different architectures, exhibiting their difference in working principle and device properties. A two-dimensional optical model, which takes into account both the electromagnetic and electronic properties of various device layers, is selected to accurately describe the device optical properties and to achieve more comprehensive simulations of solar cell properties under different device working conditions. Different carrier recombination mechanisms for two kinds of PSC architectures are also compared. The conditions under which the electrical properties of the perovskite photo-absorber layer enable QIBC PSCs to operate competitively or exhibit better device performance compared to the sandwich PSCs are examined in detail. The case of	Shalenov, E.O., Dzhumagulova, K.N., Seitkozhanov, Y.S., Ng, A., Valagiannopoulos, C., Jumabekov, A.N. Insights on Desired Fabrication Factors from Modeling Sandwich and Quasi-Interdigitated Back-Contact Perovskite Solar Cells (2021) ACS Applied Energy Materials, 4 (2), pp. 1093-1107. DOI: 10.1021/acsaem.0c02120
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QIBC PSCs with various combinations of charge-selective layers is analyzed to provide an insight into materials selection for achieving high-efficiency QIBC PSCs. It is found that power conversion efficiencies more than 25% can be potentially achieved for CH₃NH₃PbI₃-based QIBC PSCs after careful optimization of materials selection and device fabrication. The findings of this work can be used as a guideline for the design and fabrication of high-performance QIBC PSCs.
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149.	The evaluation of an asymptotic solution to the sommerfeld radiation problem using an efficient method for the calculation of sommerfeld integrals in the spectral domain	DOI 10.3390/electronics10111339 (IF=2,7; Q2 in Electronics (Switzerland))	<p>A recently developed high-frequency asymptotic solution for the famous “Sommerfeld radiation problem” is revisited. The solution is based on an analysis performed in the spectral domain, through which a compact asymptotic formula describes the behavior of the EM field, which emanates from a vertical Hertzian radiating dipole, located above flat, lossy ground. The paper is divided into two parts. We first demonstrate an efficient technique for the accurate numerical calculation of the well-known Sommerfeld integrals. The results are compared against alternative calculation approaches and validated with the corresponding Norton figures for the surface wave. In the second part, we introduce the asymptotic solution and investigate its performance; we compare the solution with the accurate numerical evaluation for the received EM field and with a more basic asymptotic solution to the given problem, obtained via the application of the</p>	<p>Bourgiotis, S., Frangos, P., Sautbekov, S., Pshikov, M. The evaluation of an asymptotic solution to the sommerfeld radiation problem using an efficient method for the calculation of sommerfeld integrals in the spectral domain (2021) Electronics (Switzerland), 10 (11), статья № 1339, . DOI: 10.3390/electronics10111339</p>
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			<p>Stationary Phase Method. Simulations for various frequencies, distances, altitudes, and ground characteristics are illustrated and inferences for the applicability of the solution are made. Finally, special cases leading to analytical field expressions close as well as far from the interface are examined.</p>	
150.	<p>Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. IV. Structures of Finite Thickness</p>	<p>DOI 10.2528/PIERB21042704 (IF=2,0; Q3 in Progress In Electromagnetics Research B)</p>	<p>The paper is focused on reliable modeling and analysis of the effects connected with the resonant transformation of the field of a plane and density-modulated electron beam flying over the periodic rough boundary of a natural or artificial medium. In the paper, such a medium occupies a part of the half-space, limited in thickness. Therefore, the numerous effects appeared due to transverse (in the thickness of the periodic structure) resonances, and the coupling of eigen regimes of two different</p>	<p>Sirenko, Y., Sautbekov, S., Yashina, N., Sirenko, K. Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. IV. Structures of Finite Thickness (2021) Progress In Electromagnetics Research B, 92, p. 149. DOI: 10.2528/PIERB21042704</p>

			<p>periodic interfaces also contributes to the anomalies appearing due to excitation of the surface eigen waves of the periodic boundary interface that had been discussed in previous papers of this series.</p>	
151.	<p>Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. III. Anomalous and Resonant Phenomena</p>	<p>DOI 10.2528/pierb21022101 (IF=2,0; Q3 in Progress In Electromagnetics Research B)</p>	<p>The paper is focused on the reliable analysis of the phenomena associated with the resonant and anomalous transformation of the field of a plane, density modulated electron beam, flying over the periodically rough boundary of a natural or artificial medium, in the field of bulk outgoing waves. The physical results presented here have been obtained as the result of numerical implementation of the rigorous mathematical models described in the two first papers of this series. The corresponding analytical constructions have been associated with the correct formulation of model problems and their algorithmization, with the provision of the possibility of a correct physical</p>	<p>Sirenko, Y., Sautbekov, S., Yashina, N., Sirenko, K. Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. III. Anomalous and Resonant Phenomena (2021) Progress In Electromagnetics Research B, 91, pp. 143-155. DOI: 10.2528/pierb21022101</p>

			interpretation of the results of their numerical solution.	
152.	Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. II. Impact of True Eigen Waves	DOI 10.2528/PIERB20110106 (IF=2,0; Q3 in Progress In Electromagnetics Research B)	This paper is the continuation and development of the discussion started in our previous work with the same title. For the first time, eigen waves of the plane boundary separating vacuum and an artificial plasma-like medium are considered in reasonably substantiated way and in a sufficiently extensive and profound volume. The possibility of extending the results obtained for a plane boundary to the case of a weakly profiled periodically uneven boundary is shown. This paper demonstrates the potential and urge to use the analytical results in the studies of the resonant transformation of the field of a plane, density modulated electron beam flying over a	Sirenko, Y., Sautbekov, S., Yashina, N., Sirenko, K. Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. II. Impact of True Eigen Waves (2021) Progress In Electromagnetics Research B, 90, pp. 9-17. DOI: 10.2528/PIERB20110106

			periodically uneven boundary of a natural or artificial medium in the field of bulk outgoing waves.	
153.	Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. I. Analytical Basis	DOI 10.2528/PIERB20110105 (IF=2,0; Q3 in Progress In Electromagnetics Research B)	The paper is focused on reliable modeling of the effects associated with the resonant transformation of the field of a plane, density modulated electron beam, flying over the periodically uneven boundary of a natural or artificial medium, in the field of volume outgoing waves. Here, the general information (analytical basis) is presented on the peculiarities and principal characteristics of electromagnetic fields arising in the situations under consideration, on the procedures for regularization of model boundary value problems describing these situations, and on possible eigen modes of periodic structures. Without relying on this information, it is impossible to advance	Sirenko, Y., Sautbekov, S., Yashina, N., Sirenko, K. Diffraction Radiation Generated by a Density-Modulated Electron Beam Flying over the Periodic Boundary of the Medium Section. I. Analytical Basis (2021) Progress In Electromagnetics Research B, 90, pp. 1-83. DOI: 10.2528/PIERB20110105

			considerably effectively in solving numerous urgent physical problems (establishing the conditions providing anomalously high levels of Vavilov-Cherenkov and/or Smith-Purcell radiation; diagnostics of beams of charged particles, artificial materials and media) and in practical implementation of new knowledge about the effects of diffraction radiation and their wave analogues in new devices and instruments of optoelectronics, high-power electronics, antenna, and accelerator technology.	
154.	A New Passive Lossless Snubber	DOI 10.1109/TPEL.2021.3056189 (IF=14,5; Q1 in IEEE Transactions on Power Electronics)	Galvanically isolated photovoltaic (PV) microinverters based on single-stage flyback topology have advantages: simplicity, better reliability, and low cost. But isolated flyback topology comes with voltage stresses on semiconductor switches caused by transformer leakage inductance. An improved regenerative snubber has been proposed to meet the ever-growing demand for higher efficiency of PV microinverters.	Dzhunusbekov, E., Orazbayev, S. A New Passive Lossless Snubber (2021) IEEE Transactions on Power Electronics, 36 (8), статья № 9345462, pp. 9263-9272. DOI: 10.1109/TPEL.2021.3056189

			<p>The proposed topology is the inductor-capacitor-diode (LCD) snubber with flying capacitor modified to reduce circulating currents. Theoretical analysis reveals a number of advantages. Experimental results are presented to verify the performance.</p>	
155.	<p>Analytical representation of the local field correction of the uniform electron gas within the effective static approximation</p>	<p>DOI 10.1103/PhysRevB.103.165102 (IF=4,3; Q1 in Physical Review E)</p>	<p>The description of electronic exchange-correlation effects is of paramount importance for many applications in physics, chemistry, and beyond. In a recent paper, Dornheim et al. [Phys. Rev. Lett. 125, 235001 (2020)PRLTAO0031-900710.1103/PhysRevLett.125.235001] have presented the effective static approximation (ESA) to the local field correction (LFC), which allows for the highly accurate estimation of electronic properties such as the interaction energy and the static structure factor. In this work, we give an analytical parametrization of the LFC within ESA that is valid for any wave number, and available for the entire range of densities ($0.7 \leq r_s \leq 20$) and temperatures ($0 \leq \theta \leq 4$) that are relevant for</p>	<p>Dornheim, T., Moldabekov, Z.A., Tolias, P. Analytical representation of the local field correction of the uniform electron gas within the effective static approximation (2021) Physical Review B, 103 (16), статья № 165102, .DOI: 10.1103/PhysRevB.103.165102</p>

applications both in the ground state and in the warm dense matter regime. A short implementation in python is provided, which can easily be incorporated into existing codes.

In addition, we present an extensive analysis of the performance of ESA regarding the estimation of various quantities like the dynamic structure factor, static dielectric function, the electronically screened ion potential, and also the stopping power in an electronic medium. In summary, we find that the ESA gives an excellent description of all these quantities in the warm dense matter regime, and only becomes inaccurate when the electrons start to form a strongly correlated electron liquid ($r_s \sim 20$). Moreover, we note that the exact incorporation of exact asymptotic limits often leads to a superior accuracy compared to the neural-net representation of the static LFC [T. Dornheim, J. Chem. Phys. 151, 194104 (2019)JCPSA60021-960610.1063/1.5123013].

156.	Screening of a test charge in a free-electron gas at warm dense matter and dense non-ideal plasma conditions	DOI 10.1002/ctpp.202000176 (IF=2,1; Q3 in Contributions to Plasma Physics)	The screening of a test charge by partially degenerate non-ideal free electrons at conditions related to warm dense matter and dense plasmas is investigated using linear response theory and the local field correction based on ab initio Quantum Monte-Carlo simulations data. The analysis of the obtained results is performed by comparing to the random phase approximation and the Singwi–Tosi–Land–Sjölander approximation. The applicability of the long-wavelength approximation for the description of screening is investigated. The impact of electronic exchange-correlations effects on structural properties and the applicability of the screened potential from linear response theory for the simulation of the dynamics of ions are discussed.	Moldabekov, Z.A., Dornheim, T., Bonitz, M. Screening of a test charge in a free-electron gas at warm dense matter and dense non-ideal plasma conditions (2021) Contributions to Plasma Physics, . DOI: 10.1002/ctpp.202000176
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157.	Electro-physical properties of porous anodic alumina films for sensitive elements of MEMS	DOI 10.1088/1742-6596/1954/1/012021 (IF=0,7; Q4 in Journal of Physics: Conference Series)	The results of a comprehensive study of porous alumina film electrical properties obtained by anodizing in acid electrolytes have been presented. The relationship was established between the structure of oxide films, the mechanism of their formation, as well as physicochemical characteristics. A targeted effect on the microstructure of the films made it possible to control their properties by varying the technological parameters without a radical change in the method. This made it possible to predict the behavior of nanostructures and properties for sensitive MEMS elements.	Korobova, N.E., Batalova, M.S., Alpysbayeva, B.E. Electro-physical properties of porous anodic alumina films for sensitive elements of MEMS (2021) Journal of Physics: Conference Series, 1954 (1), статья № 012021, . DOI: 10.1088/1742-6596/1954/1/012021
158.	Influence of the drying method on the structure of aluminum oxide capillary-porous nanomembranes	DOI 10.1088/1742-6596/1954/1/012001 (IF=0,7; Q4 in Journal of Physics: Conference Series)	Porosity characteristics are widely used to assess the internal structure of nanomembranes. The membrane was considered complex in the analysis of the structure. The membrane was presented in a simplified way as a system interacting with a dispersion medium, for example, water. A physicochemical model of the membrane has been proposed, which allows one to study the	Batalova, M.S., Korobova, N.E., Alpysbayeva, B.E. Influence of the drying method on the structure of aluminum oxide capillary-porous nanomembranes (2021) Journal of Physics: Conference Series, 1954 (1), статья № 012001, . DOI: 10.1088/1742-6596/1954/1/012001

			<p>logical and structural similarity between systems, the properties of which are known, with similar systems, but with unknown properties. We have chosen a simple mechanical model of a membrane permeable to liquid and gas molecules. Permeability was determined by the characteristics of the porosity, shape, and size of the pores.</p>	
159.	<p>Dependence of the Pore Wall Thickness on the Anodizing Process Parameters for Nanoporous Alumina Membranes</p>	<p>DOI 10.1109/EIConRus51938.2021.9396213</p>	<p>The paper presents experimental results related to the preparation of a nanoporous membrane-based on nanoporous alumina. The results of the dependence of the nanomembrane structural parameters on the parameters of the anodizing process have been obtained. Nano-membranes based on metal oxides are promising materials in the field of materials science and nanotechnology. The formation of ideal nanoporous membranes depends on the control of the anodizing process parameters and on the starting materials.</p>	<p>Batalova, M., Alpysbayeva, B., Korobova, N.E. Dependence of the Pore Wall Thickness on the Anodizing Process Parameters for Nanoporous Alumina Membranes (2021) Proceedings of the 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering, EIConRus 2021, статья № 9396213, pp. 2419-2422. DOI: 10.1109/EIConRus51938.2021.9396213</p>

160.	Study of the Structural Features of Nanofibers of Nanoporous Aluminum Oxide Using Optical Microscopy	DOI 10.1109/ElConRus51938.2021.9396392	Optical microscopy is currently one of the widely used methods used to study micro- and nanostructured materials. Despite the fact that optical microscopy is inferior in resolving power to atomic force and scanning electron microscopy, in most cases this method makes it possible to efficiently investigate various structures. Nanofibers based on nanoporous alumina are of interest as a hydrophobic surface. Therefore, the study of its structural features is a promising research work.	Meruyert, K., Alpysbayeva, B., Smirnov, V. Study of the Structural Features of Nanofibers of Nanoporous Aluminum Oxide Using Optical Microscopy (2021) Proceedings of the 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering, ElConRus 2021, статья № 9396392, pp. 2455-2458. DOI: 10.1109/ElConRus51938.2021.9396392
161.	Etching of the Aluminum Foil Surface Using High-Frequency Plasma to Produce a Nanoporous Aluminum Oxide Membrane	DOI 10.1109/ElConRus51938.2021.9396575	This work is related to the treatment of the surface of aluminum foil with plasma in a high-frequency discharge and the formation of a nanoporous aluminum oxide membrane based on it using an electrochemical anodizing process. It was known that after plasma etching, tracks were formed on the surface of aluminum foil. It is established that these changes will depend on the power of the high-frequency discharge. The surface of aluminum foil treated with	Amirbekova, G., Alpysbayeva, B., Erlanuly, E., Smirnov, V. Etching of the Aluminum Foil Surface Using High-Frequency Plasma to Produce a Nanoporous Aluminum Oxide Membrane (2021) Proceedings of the 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering, ElConRus 2021, статья № 9396575, pp. 2411-2414. DOI: 10.1109/ElConRus51938.2021.9396575

			<p>plasma and nanoporous aluminum oxide membranes formed after electrochemical anodizing were studied using scanning electron microscopy.</p>	
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