Softening is the treatment of water to reduce its hardness, that is, to reduce the concentration of Ca^{+2} and Mg^{+2} ions by various physical, chemical and physicochemical methods. It is one of the main and mandatory operations for the water treatment of process water.

In the physical method, water is heated to a boil, as a result of which soluble calcium and magnesium bicarbonates are converted into their carbonates, which precipitate:

$$Ca(HCO_3)_2 = CaCO_3 + H_2O + CO_2.$$

This method removes only temporary stiffness. Chemical softening methods include phosphate and lime-soda, consisting in the treatment of water with trisodium phosphate or a mixture of calcium hydroxide and sodium carbonate. In the first case, the reaction of the formation of insoluble tricalcium phosphate precipitates:

$$3CaSO_4 + 2Na_3PO_4 = 3Na_2SO_4 + Ca_3(PO_4)_2.$$

In the second case, two reactions proceed. Calcium and magnesium bicarbonates react with calcium hydroxide, thereby eliminating temporary hardness:

$$Ca(HCO_3) + Ca(OH)_2 = 2CaCO_3 + 2H_2O,$$

and sulfates, nitrates and chlorides - with sodium carbonate, which eliminates constant hardness:

$$CaSO_4 + Na_2CO_3 \rightarrow CaCO_3 + Na_2SO_4.$$

Sour gas is natural gas that contains corrosive, sulfur-bearing compounds such as hydrogen sulfide and mercaptans.

Sour crude oil is crude oil containing an abnormally large amount of sulfur compounds; see also **Sweet crude oil.**

Specific acid-base catalysis is a catalytic reaction which velocity is proportional to the concentration of protons H^+ or hydroxide ions OH^-. Such regularity is observed in case transfer of H^+ or OH^- to a molecule of reagent is carried out quickly and precedes the limiting stage. At the same time the speed of catalytic reaction doesn't depend on nature the catalyst (at constant pH).

Specific catalytic activity (SCA) is the catalytic activity per unit surface of a solid phase catalyst. In some cases, the specific catalytic activity is determined per unit surface area of the active component.

Specific productivity of the reactor is the amount of product formed per unit time in a unit of reactor volume. This value is often used to compare the efficiency of industrial reactors.

The specific surface area (specific surface) is the surface area related to the mass of the corresponding phase. As adsorbents and catalysts substances with specific surface area from ~ 10 m^2/g to ~ 1,000 m^2/g are applied.

Specific volume of pores is the volume of pores in a solid, per unit mass.

Spillover is a transfer of adsorbed particles from the active component to the carrier. It occurs as a result of surface diffusion of particles formed as a result of dissociative adsorption on the active component.

The speed-defining stage is a stage which parameters are included into expression for resultant speed gross - reactions.

Sol is a dispersed system formed by particles of a liquid or solid, which are distributed in a liquid or gaseous dispersion medium. The particle size of the dispersed phase is from 1 to 100 nm.

The sol-gel method is a method for synthesizing catalysts and adsorbents. Includes a number of consecutive stages: hydrolysis of the starting material in the solution, the formation of low molecular weight complexes and their further conversion to sol, the formation of a gel-like structure of the sol particles, the aging of the gel, the drying of the gel. The advantage of the sol-gel method is the ability to control the composition and microstructure of the porous body at the molecular level, which ensures homogeneity of chemical, physical and morphological properties in the resulting material.