

The physicochemical parameters influence on the hydrogen sorption evolution from multicomponent mixtures

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Abstract

The results of a study of the physicochemical parameters influence on the evolution of hydrogen from a multicomponent mixture are presented. It is shown that the search for alternative energy sources is currently one of the urgent tasks in various fields of science, industry and ecology. The most promising under the current conditions is the transition to the use of hydrogen fuel. At the same time, hydrogen is used both as a caloric additive to hydrocarbon fuel to reduce the toxicity of combustion products, and for independent use as a fuel. The relevance of the study of the problem of the use of hydrogen is associated with the possibility of obtaining a greater amount of energy than when using a similar amount of gasoline, as well as with its widespread use in the chemical, electronic, pharmaceutical industries, in the automotive industry, metallurgy, etc.

The work showed that to obtain pure hydrogen from gas mixtures, mainly three main processes of hydrogen concentration are used: selective filtration through polymer membranes; short cycle adsorption; cryogenic separation. The choice of one or another method of hydrogen evolution depends, as a rule, on economic indicators and technology flexibility. In this case, the most widely used in the production of high-purity hydrogen are adsorption methods, which feature are a high degree of extraction of impurities, as well as low operating costs and comparative ease of implementation. Typical substances associated with hydrogen are nitrogen, carbon monoxide and carbon dioxide, methane. A problem in the adsorption production of hydrogen is also the high selectivity of the sorbents used to the components of mixtures of hydrogen-containing gases associated with hydrogen. Promising materials for these purposes are sorbents with a molecular sieve effect – molecular sieves and carbon molecular sieves of various production, but the choice of a specific material for this task is a very acute analytical task, since the material should have many positive characteristics. The influence of such physicochemical parameters on the process of adsorption of hydrogen from a multicomponent mixture, such as the concentration of production hydrogen, the velocity of the gas mixture in the adsorber, and the pressure at the adsorption stage, is studied.

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