



ZEOLITES WITH HIGH SORPTION AND CATALYTIC PROPERTIES

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Abstract. The industrial production of catalysts with high catalytic activity from zeolites and their derivatives, which possess sorption and catalytic properties, for the removal of acidic components and moisture from natural gas is becoming increasingly widespread. Here, the hydro creation process is examined as one of the most efficient and versatile methods for processing high-molecular-weight hydrocarbon feedstock. The possibilities for obtaining a wide range of commercial reaction products and raw materials for chemical and petrochemical processes have been examined.

Keywords: *sorption, moisture, zeolite, natural gas, liquid hydrocarbon, catalytic property, hydrocracking, NaX, CaX.*

Zeolites and their derivatives with high sorption and catalytic properties are being produced in volumes increasing year-on-year by enterprises manufacturing catalysts with high catalytic activity intended for the industrial conversion of natural gas into liquid hydrocarbons. -year period, and in ever-increasing volumes. The development of the scientific foundations for preparing and utilizing high-adsorption and catalytic zeolites has become an independent branch of fundamental research [1].

In practice, the most widely used high-adsorption and catalytic zeolites include NaA and KA zeolites, which are used for drying liquids and gases. The latter is also used for drying bioethanol. Interestingly, the more hydrophobic the adsorbate, the deeper the purification. At 20 °C and 10% compressed air humidity, the equilibrium water adsorption on the high-adsorption and catalytic zeolites is 10 mmol/ g of zeolite with high sorption and catalytic properties. NaX is also used for separating hydrocarbons, removing methane from hydrogen, and enriching air to up to 95% oxygen. CaX and CaY are used for stereoisomer separation, for example, glucose/fructose, and NaX and CaX, which are zeolites with high sorption and catalytic properties, are used to separate alkenes from alkanes [2].

Cationic zeolites, which possess high sorption and catalytic properties, are widely used as adsorbents because they contain moderately strong Bronsted sites located both inside and outside the zeolite pores, It is also characterized by the presence of strong Lewis acid sites on the external surface of the highly sorptive





and catalytic zeolite. The presence of weak Lewis centers, which are capable of not only adsorbing but also readily desorbing certain polar molecules, helps to simplify the regeneration process of highly adsorbing and catalytic zeolites [3]. LTA-type zeolites with high sorption and catalytic properties, in either the Na- or Ca-form, can be used as a component of a highly catalytically active catalyst for the hydrotreatment of ethylene series hydrocarbons and for the production of liquid hydrocarbons from natural gas. They can be used as a component of a catalyst with high catalytic activity, designed for the hydrotreating of ethylene series hydrocarbons and for the production of liquid hydrocarbons from natural gas using ruthenium.

HZSM-5 is also used as a highly catalytically active catalyst in the acid-catalysed hydration of cyclohexane to cyclohexyl alcohol in an aqueous medium at 120 °C for the production of liquid hydrocarbons from natural gas. H-Beta, a zeolite with high sorption and catalytic properties, is used in industry for the liquid-phase synthesis of cumene by alkylating benzene with propylene. A high-activity catalyst based on HMOR zeolite with high sorption and catalytic properties, intended for the production of liquid hydrocarbons from natural gas, for the skeletal isomerization of C₄–C₆ saturated hydrocarbons, at 250°C. –C₆ saturated hydrocarbons for the skeletal isomerization of standard natural gas to liquid hydrocarbons, a high-activity catalyst [3]. Ultra-stable HY (USY) is traditionally used at 300–450 °C and at 50–200 atm of pressure, as a component of a high catalytic activity catalyst designed for the production of liquid hydrocarbons from natural gas via hydrocracking.

Y-type zeolites with high sorption and catalytic properties are used for tight hydrocracking when it is necessary to selectively remove components of the petrol fraction. In this case, A rare metal (often Pt) is incorporated into a high-sorption and catalytically active zeolite to enhance the activity of a catalyst with high catalytic activity, which is intended for the hydrogen transfer reaction to obtain liquid hydrocarbons from natural gas. This ensures the desired cracking/hydrogenation balance.

Hydrocracking is one of the most effective and versatile processes for processing high molecular weight hydrocarbon feedstock. This allows for the production of a wide range of commercial reaction products and feedstocks for other chemical and petrochemical processes.

on catalysts with high catalytic activity, designed for the production of liquid hydrocarbons from natural gas with high acidity (i.e., high-catalytic-activity catalysts comprising a zeolite with high sorption and catalytic properties for





obtaining liquid hydrocarbons from natural gas) The hydrotreating of high molecular weight kerosene occurs mainly via a carbocation mechanism, with the cleavage of the C–C bond at the lowest energy point in the middle of the carbon chain.

Firstly, the kerosene are dehydrogenated and, on the metal centers of a catalyst with high catalytic activity designed for converting natural gas into liquid hydrocarbons, ethylene-series hydrocarbons are formed. The ethylene-series hydrocarbons at the acid sites then convert into carbocations and initiate the chain reaction. The rate of hydrocracking increases with the molecular weight of the saturated hydrocarbons. Isomeric saturated hydrocarbons with tertiary carbon atoms are cracked at a much higher rate than normal saturated hydrocarbons. The decomposition of carbocations by the elimination of fragments containing fewer than three carbon atoms is highly endothermic, so hydrocracking produces very little methane and ethane, but the yields of isobutane and isopentane are considerably higher.

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