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Various questions of preparation of heterogeneous catalysts for reactions stimulated by microwave radiation

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The possibility of effective implementation heterogeneous-catalytic reactions in electro-magnetic microwave field without the involvement of traditional methods of thermal influence is determined not only by the activity of used catalysts but by the enough quantity of heat for this process proceeding exceeded by then during the transformation of energy of microwave radiation. In this situation the most achieved dissipation of microwave radiation energy in the volume of catalyst mixture is necessary condition of rational energy consumption. The purpose of the given research is the illustration of the worked out by us the methodology of the catalysts synthesis displaying high activity and selectivity in the reactions of dealkylation of alkylaromatic hydrocarbons deep gasphased oxidation of butane and hydrocarbon monoxide, liquid phased oxidation of xylols. They all are capable of absorbing and transforming the energy of microwave radiation field into the heat, necessary for the achievement of optimal temperature regime of process proceeding. All the stages of the thermal influence at the preparation of catalysts of marked type, including hydrothermal synthesis Al_2O_3/Al - carrier, drier of saturated samples thermolysis of salts of active components and formation of catalytically active oxide phases were implemented in the microwave radiation field.

The experiments on the thermal processing of precursors of potential catalysts were proceeded on the unit designed on the basis of the laboratory microwave heater NC-1064 (Panasonic) with the resonator volume 14 with the outlet power of magnetron 800 Wt at the working frequency of 2450 MHz. The study (research) of the morphology of the samples by the methods of scanning electronic microscopy showed that in the samples synthesised in the conditions of traditional thermoprocessing crystallinities of oxides of active components in the form of the associates with the rather large sparseness of linear sizes (50–600 nm) are formed on the surface of the carrier. It is stipulated (due to) by the irregular heating and prolonged display of samples in the stages of metals sinters thermolysis and subsequent hard phases transformation of oxides compositions into catalytically active phases. It is shown that the observed effect of intensification of above mentioned reactions in the presence of the catalysts synthesised by thermoprocessing into microwave radiation field is due to the formation of more developed active surface, at the expense of the formation of catalytically active phases in the form of the regular distributed nanosized clusters with linear sizes. In case of liquid phased oxidation of xylol at the influence microwave radiation at the expense of difference of dielectric losses in marks of heterogenic catalyst and volume of transformed hydrocarbons the appearance of zones of local overheating takes place. Their temperature exceeds overestimated temperature of reaction space what can be the additional cause of the observed increasing of specific rate of initiation of free radicals and in the conditions of developing reaction - the reduction of time of the achievement of maximum outlet of purpose products.

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