Nanocomposites and nanomaterials

Mechanochemistry in nanocatalysts preparation

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Mechanochemistry as alternative method of the catalysts preparation can be used by three pathways: i) mechanochemical activation of the catalysts prepared by traditional methods (**MChA**), ii) mechanochemical treatment of initial compounds and their use in traditional synthesis (**MChT**), iii) direct mechanochemical synthesis of the catalysts from initial compounds (**MChS**). In the most cases the positive effect of this treatment is connected with nanoparticles or nanocrystalline domains on solid amorphous matrix formation. In this communication our results obtained at all three ways use for different nanocatalysts preparation and their application in hydrocarbons selective oxidation present.

MChA. It was shown that the V_2O_5 activation permits to obtain the catalyst of benzene oxidation to maleic anhydride more effective that industrial promoted VMoO catalyst which connected with formation of nanocrystalline domains in amorphous oxide matrix. Treatment of MoO_3 allows to formation of molybdenum suboxide nanoparticles and the preparation of the catalyst for direct gas phase benzene oxidation to phenol by air. Activation of industrial VPO catalyst permits to obtain nanodimensions crystalline clusters and its leads to increase its activity and selectivity in n-butane oxidation to maleic anhydride..

MChT. The use of mechanically activated V_2O_5 with nanodimension particles in VPO-Me catalysts synthesis accompanied by an increase their selectivity to phthalic anhydride in n-pentane oxidation.

MChS. Treatment of V_2O_5 and TiO_2 oxides mixture permits to obtain the catalyst for o-xylene oxidation to phthalic anhydride more effective than industrial catalyst of this process with low temperature of operation. This fact is connected with vanadium oxide nanoparticles formation on TiO_2 surface. It was shown that nanodispersed $BaTiO_3$ prepared from BaO and TiO_2 mixture demonstrates high activity in photocatalytic dyes decomposition in water.

The physical-chemical properties of the catalysts after treatment were studied by XRD, BET, XPS, SEM, TEM, AFM methods.