

Investigation of the Morphology of Vanadyl Pyrophosphate ((VO)₂P₂O₇) and its Precursor(VOHPO₄·0.5H₂O) by Scanning and Transmission Electron Microscopies

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Abstract

The present work investigates the structure, state and morphology of vanadyl pyrophosphate particles obtained through thermal activation of vanadyl hydrophosphate in vacuum in the temperature range 360 – 400° C. A comparison of structures, states, morphologies, and catalytic activities of different vanadyl pyrophosphate samples obtained via the traditional method in the n-butane and air mixture at 440° C and through a mechanical treatment of the precursor in a planetary mill is conducted. It is shown that thermal treatment of VOHPO₄·0.5H₂O in vacuum at 400° C leads to the formation of the (VO)₂P₂O₇ phase. The morphology of the initial reagent is preserved. Under mechanical treatment, the precursor morphology is changed significantly. This process is accompanied by dispersion of particles and the formation of a layer structure with porous surface. The precursor treatment in the mixture of n-butane and air at 440° C results in the reduction of the size of particles and forming of dents on the surface resembling craters. It is shown that the mechanical treatment method is more advantageous by catalytic activity as compared with the traditional one and thermal activation in vacuum.