FROM 3D TO 2D ALYUMOSILICATES NANOMATERIALS: SYNTHESIS, PECULIARITIES OF MORPHOLOGY AND PROSPECTS OF CATALYSIS APPLICATION

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Synthesis of new materials with an improved set of characteristics and a systematic study of their properties remains an urgent task. Aluminosilicates deserve special attention. They are widely used in heterogeneous catalysis, for example, in oil refining, organic synthesis and etc. The effectiveness of the use of aluminosilicates depends on the spatial availability of their active centers. One of the ways to improve this characteristic is the transition from volumetric 3D bodies to 2D structures. This paper shows the possibility of synthesizing two-dimensional structures - films of aluminosilicates with given textural characteristics by the electrochemical method.

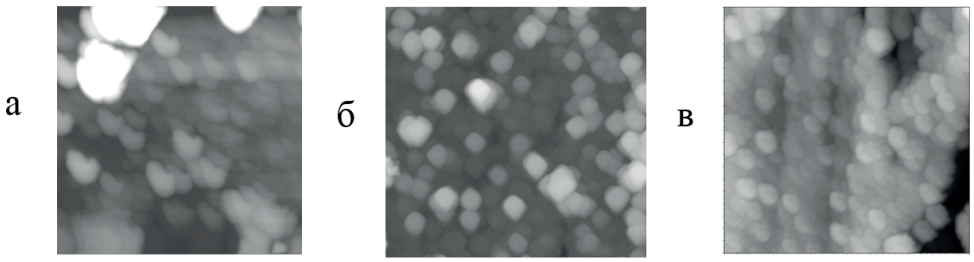

Fig. 1. AFM-image of films of different nature. 2 × 2 mkm

During electrolysis of aqueous systems containing Na_2SiO_3 and NaOH in specified ratios, at different voltages at the anode (aluminum, A99), a thin film of aluminosilicate of a given chemical composition is formed. The chemical nature of the coating was identified by X-ray, IR and Raman spectroscopy. The thickness of the films varies from ~ 1.0 μm to 18.5 μm, and the specific surface area from ~ 250 m^2/g to ~ 650 m^2/g depending on the synthesis conditions. The characteristic linear dimensions of the pores and the main structural elements of the films were determined by the AFM method: three-dimensional shapes in the form of globules, pyramids or cubes of nanometer dimension (Fig. 1). The photocatalytic activity of the synthesized structures was studied by the example of the destruction of brilliant green and methylene orange.

The data obtained are useful both for fundamental science, in the study of the properties of synthetic aluminosilicates and materials based on them, and in their applied character in the preparation of new composite and functional materials with high catalytic activity.