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Structural-size effects in the products obtained by the molecular layering method and their application.

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The molecular layering method (ML) (or Atomic Layer Deposition - ALD) actively began to develop in many countries since the mid-seventies [1 - 3]. Period of purely fundamental research was completed by the mid-seventies of the 20th century. To date, more and more attention is in the research of applied development, primarily for high-tech industries [3 - 6]. In solving of the applications it is important to use the most well-known advantages of ML-ALD: precision, high repeatability, conformity of nano-layers and others.

In report presents a classification of theoretically grounded in the works of S.I. Kol'tsov the structural-size effects in the products obtained by using of ML method.

The effect of the monolayer - is the most promising in the process, when on the substrate surface should be evenly and firmly fix the small number (at the level of a few monolayers) functional components- it is often necessary in creating of sorbents, catalysts, fillers, sensors etc.

The effect of overlap substrate - it can be implemented in obtaining relatively thick coatings (several tens or hundreds of nanometers), when there is physical overlap of the substrate and the surface layer acquires properties of new incremental substance. Such systems are very interesting in the preparation of pigments and fillers for composites, protective coatings and other functional films.

The effect of the mutual coordination of structure of the substrate surface and of the new layer - chemical nature of the matrix, the composition and morphology of the active sites on the surface affect on the local composition and structure formed during the synthesis of the centers that can increase the speed and reduce the energy of the phase changes in the formed layer - it may be of interest to regulate the sintering conditions ceramics, the speed of solid-phase chemical reactions.

The effect of a multicomponent system - opens the possibility of creating of synergies structures, that allows to create coatings with multifunctional properties, designing selective catalytic - and sorption - active materials i.e. to create materials with fundamentally new properties. The report presents some of the latest results of the practical application of these effects: catalysts of oxidative dehydrogenation of methanol, of ethane in ethylene, catalytic membrane reactors, functional nanostructures on the surface of polymers, of quartz optical fibers, of carbon fibers, active additions on the surface of ceramic materials and other. Investigations are supported by RSF(contract №.4-13-00597).

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