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FORMATION OF POLYFUNCTIONAL PEROXITE-LIKE LAYERED OXIDE MATERIALS USING COORDINATED REE NITRATE PRECURSORS AND ALKALI METALS

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The research results presented in the work make it possible to summarize important for practical use information about alkali-coordination nitrates of rare earth elements of the cerium subgroup. They are used as precursors of promising modern multifunctional materials. With the application of a complex of physical and chemical methods, the data on the conditions of their formation and existence, the nature of the chemical bond, the composition, structure, shape of coordination polyhedra Ln, and the type of coordination of ligands were clarified. The existence of their isotopic series according to the stoichiometry of composition, structure and manifested characteristic properties was revealed. The obtained information (as primary) is the basis for detection, identification, control of the phase state of processing objects at the preparatory stages. This is especially important at the stages of forming technological schemes of transformations, when choosing criteria for the compatibility of constituent components, clarifying the phasing and conditions of their implementation.

A number of modern innovative applications include the formation of single-layer and layered nanostructured oxide composite systems of lanthanides and transition elements of general purpose with catalytic and photocatalytic activity, self-cleaning coatings with hydrophilic properties. Methods of development of various combined methods of activation of such researched processes and controlled modification of the properties of the obtained target products are proposed. The established technological and functional dependencies are evaluated.

New information on the reactivity and transformation of layered perovskite-like oxides, stabilization of photocatalytic and sensor-active crystal modification of TiO₂ - anatase became the initiator of the continuation of our research on this topic. And today, the ways of managing the technical parameters of target products through the choice of composition, synthesis conditions and processing method are being refined.

Nowadays, thanks to technological methods of "soft chemistry" reactions, it has become possible to create substances with various structural features, to obtain metastable compounds through a sequence of low-temperature topochemical syntheses. Of particular interest in this regard are hybrid synthesis methods that combine the advantages of each of the used methods (methods of synthesis of elements by pyrolysis and hydrolysis, Pechini method, burning of liquid nitrate precursors, sol-gel method) and use liquid nitrate precursors of elements of different electronic structures.

Empirical data obtained by the authors about the conditions of formation and existence, peculiarities and regularities of the atomic-crystalline structure, properties, nature and stability of thermal transformations of alkaline coordination nitrates of lanthanides play an important role in optimizing the development of the technology for the production of new multifunctional REE-containing materials. They are an important stage in the development of an experimental and theoretical scientific database on layered compounds and the processes involved; their unique properties, which are determined by the two-dimensional nature of the construction of the interlayer space, the distortion of the structure of the titanium-oxygen octahedra of the perovskite layer, and the high mobility of alkali metal cations.