PECULIARITIES OF TRANSFORMATION REE-CONTAINING SYSTEMS OF NITRATE PRECURSORS IN THE PREPARATORY PROCESS OF FORMATION MULTI-FUNCTIONAL OF OXIDE MATERIALS

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The research is aimed to solving the fundamental problems of creating new and improving existing technologies for obtaining perfect oxide phases of transitional and rare earth elements with the structure of defective perovskite, garnet with reproducible properties by low-temperature methods of "soft chemistry" and using nitrate precursors. They have a complex structure and in scientific and technological terms are complex objects that are intensively investigated.

General principles concerning the distribution of cations according to the crystallographic locations of their structure are now formulated and the great possibilities of isomorphous substitutions have been revealed. Methods of managing the parameters of functional materials on their basis are found out by the choice of composition, conditions of synthesis and subsequent processing. The processes for obtaining the target product pass through a series of stages and is accompanied by the formation of intermediate phases. Knowledge about their composition, conditions of formation and existence, properties, features and regularities of transformation give an opportunity to manage these processes and conduct its directed synthesis.

The purpose of this work is the fundamental research of cooperative processes that take place in obtaining these materials at the preparatory stages using nitrates of elements of different electronic structures, and finding possible methods of influence on liquid phase and solid phase systems based on the thermal activation of reagents, in order to reproduce their structural-sensitive characteristics.

Using the complex of physicochemical methods, the nature and regularities of chemical interaction, thermal transformations (25–1000°C) in model systems of rare-earth nitrates and elements of IA, IIA groups of the periodic system, ammonium, which are now widely used in syntheses of polyfunctional oxide materials of various applications are studied. The formation of an entire class of anionic coordination compounds of Ln^{3+} was found. Their composition, possible types of compounds, concentration limits of crystallization of phases, the nature of their solubility, phase diagrams of solubility were constructed. All of them are synthesized in monocrystalline form. Their individuality was confirmed and a systematic study of the atomic-crystalline structure and a number of their properties was carried out. The mechanism of complexation in systems can be explained from the positions of competing substitutions of water molecules in the immediate environment of Ln^{3+} on NO_3^- - groups and the influence on these processes of the nature of the central atom of the Ln^{3+}- complexer, disordering effect on the structure of solutions of available M^+, M^{2+} cations, concentration and nature of the thermal motion structural elements. In systems, differences in the complexing ability of elements of cerium and yttrium subgroups, as well as in REE within the first sub group, were revealed; the significant influence of the thermal factor. The resulting competing reactions are potent technological factor significantly impacting on change of activity of structural forms Ln^{3+}.