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SOME PHYSICAL AND CHEMICAL ASPECTS OF THE PREPARATORY STAGES OF THE FORMATION OF PHOTOCATALYTIC ACTIVE COATINGS

O. Dryuchko^{1*}, V. Cherginets², V. Soloviev³, N. Bunyakina⁴, Yu. Golik⁵, O. Illiash⁶

^{1, 3, 4, 5, 6} *National University "Yuri Kondratyuk Poltava Polytechnic", 24 Pershotravnevy prospect, 36011, Poltava, Ukraine; e-mail* : dog.chemistry@gmail.com*

² *Institute of scintillation materials of the national academy of sciences of Ukraine, Nauky ave. 60, 61072, Kharkov, Ukraine.*

A comprehensive systematic study of the interaction of structural components in nitrate systems of lanthanides of the cerium subgroup and representatives of the IA group (Li, Na, K) of elements of the periodic system - precursors of modern multi-component oxide multifunctional materials based on them. The formation of a representative class of alkaline coordination nitrates Ln was established. Their composition, conditions of formation, atomic-crystalline structure, forms of Ln coordination polyhedra, types of ligand coordination, a number of their properties were studied using a complex of physicochemical methods: chemical, X-ray phase, X-ray structural, IR-spectroscopic, crystal-optical, thermo graphic, GDH laser radiation. The obtained data are the basis for detection, identification, control of the phase state of processing objects in the preparatory stages during the formation of self-cleaning coating layers of building construction materials according to innovative technologies using nanostructured composite systems of lanthanides and transition elements with photo catalytically active and hydrophilic properties, various combined methods of their activation and establishment of technological and functional dependencies, controlled modification of the properties of the resulting products.

Photo catalytically active coatings are deposited using a wide variety of technologies, such as sol-gel, spray pyrolysis, methods of chemical vapor or gas phase deposition, and magnetron sputtering. Currently, regulations are being introduced using "burning solutions" methods.

A promising class of photo catalytically active complex oxide materials of rare earth elements and titanium, which can act as alternatives to already existing developments, are nanostructured layered perovskite-like compounds and solid solutions based on them. Depending on the composition and structure, they have a wide range of physical and chemical properties. The perovskite-like layered titanates presented in this work belong to the homologous series $(\text{Me}, \text{Ln})_{n+1}\text{Ti}_n\text{O}_{3n+1}$ – Ruddlesden-Popper phases, where Me is H, Li, Na, K, Rb, Cs; Ln – La, Nd, n – the number of perovskite nanolayers, with a thickness of one layer of approximately 0.5 nm.

The obtained system of knowledge about transformation processes in systems of REE-containing nitrate precursors and crystal chemical properties of samples of Ln coordination nitrates acquires special value in the formation of nanostructured layered perovskite-like compounds of lanthanides and transition elements (including titanium), solid solutions based on them; when establishing technological and functional dependencies between the method of preparation, the variability of the method of activation of technological systems, the methodology of manufacturing the target product and its phase composition, lattice parameters, the size of the specific surface, the morphology of the constituent particles, the activity of the layers of self-cleaning compositions with photo catalytic and hydrophilic properties formed on the surface of construction and special structural elements; in the practical implementation of innovative projects of decomposition of water for the purposes of obtaining hydrogen (as an alternative type of fuel), decomposition of toxic organic substances in solutions and air, incomplete oxidation of carbohydrates; when obtaining other perovskite-like phases by means of ion exchange reactions and in other spheres.