Nanocomposites and nanomaterials

Perspectives of Design of Crystalline Nanocomposites with Tailored Anisotropy as Active Elements in Optoelectronics

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In recent years through the development of nanotechnology an interest in the development and investigation of nanoporous materials that are the most promising materials in different areas of science is constantly growing [1]. Besides using nanoporous materials in optoelectronics [2] they have the possibility of combining their properties with the properties of nanoparticles or even other nanostructures that their pores can be filled with resulting in creation of new types of materials with more clearly pronounced properties.

To investigate the proposed materials interaction, we offer design, creation technology and manufacturing of the proposed crystalline nanocomposites with tailored anisotropy [3]. In developing these nanocomposites important task is to combine the concepts of directed manufacturing of nanomatrices in a wide range of structures and geometries of these nanopores (see. the proposed range of these products by SmartMembrane Ltd.). Mathematical modeling of such structures that takes into account all the initial conditions is crucial for the directional creation of nanomatrices and appropriate control of ordered nanocrystals formation of a tailored anisotropy. This takes into account the process of deep understanding of pores formation and nanocrystals crystallization inside them. In particular, to improve the respective of optoelectronic devices the most interesting original condition (this is our innovative idea) is to fill these nanopores with crystalline material in the form of nanocrystals with a tailored direction of crystallization [3]. Thus, using the benefits of the most effective crystallographic direction for the respective properties of the material [4] new materials will be created. As the primary filler it is proposed to use ADP or $Ba(NO_3)_2$ crystals.

Our ultimate goal is to focus on maximizing the value of the induced optical effects in the selected crystalline material and extrapolate the same approach for nanocrystallites in creating appropriate nanocomposites. This means that by stabilizing the desired direction of growth of nanocrystals inside the nanopores of host matrices could improve their optical performance through more effective interaction of light with an active nanostructured environment.

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