

Glass-ceramic and hybrid nanocomposites with luminescent complex oxide fillers: research and possible applications

Friday, November 8, 2024 10:00 AM (20 minutes)

This talk concerns research of optical nanoscale materials which are synthesized/manufactured by our research team in Kyiv, and are being researched in Ukraine and beyond. The history of these studies goes back 11 years, and it was preceded by the study of the inorganic molecular anions (MA) like $XOnm^-$ ($X = S, Se, Te, Cr, V, Mo$, etc) in frozen aqueous solutions. Then, there were studies of inorganic oxide heterodesmic crystals doped with MA, ions of rare earth (RE), and transition elements (TE). The experience allowed us to start elaborating on the composite materials containing nano/microparticles of the mentioned and similar types of crystals and MA.

Today, our research is focused on the glasses and glass ceramics made on the basis of simple oxides of alkali metals, boron, phosphorus, molybdenum, and tungsten. Another direction is the study of hybrid nanocomposites, where the matrix is fibrillated, nano-sized, or microcrystalline cellulose.

The elaborated composites possess both intrinsic and impurity short-decay and long-lasting luminescence caused by ions of heavy metals, RE, and TE located in the matrix or the filler: incorporated crystalline particles.

Hybrid composites, under certain conditions, also exhibit mechanoluminescent and piezoelectric properties. Special attention is paid to the study of the influence of the interphase layers on the nanocomposites' properties. These layers are formed between the matrix and the filler by the interdiffusion of their atoms and molecules.

The research combines the synthesis/fabrication of composites, a wide range of experimental and theoretical calculations, and modeling.

Type of presence

Presence at Taras Shevchenko National University

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