

Nanocomposites and nanomaterials

Fabrication, conductivity and photoluminescence properties of the $\text{Li}_2\text{O-xGeO}_2$ glass-ceramic doped with some three charged ions

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The germanate glasses were intensively studied last years. One of the most popular substances of the family is lithium germanate with $\text{Li}_2\text{O-xGeO}_2$ composition. Mentioned materials are suitable host for luminescent active ions that makes them very attractive materials for optical application, e.g for laser systems.

Three types of the un-doped and doped with 3+ charged ions (Cr, Eu and Nd) $\text{Li}_2\text{O-xGeO}_2$ (x=7; 11.5) LGO samples were prepared using several stage of heat treatment: initial glasses, intermediate glass-crystalline samples, polycrystalline. Morphology of the sample's body and surface as well as physical properties of the mentioned LGO ceramics three states were studied. Morphology of the samples surface was monitored using optical, electronic and AFM microscopy. The values of conductivity, $\sigma(T)$, were measured by the bridge method in an alternating current electric field at frequency $f = 1$ kHz in the temperature range from 300 to 950 K. Light scattering data was also used for samples surface characterization.

Photoluminescence (PL) emission and PL excitation spectra were studied at 4.2, 77 and 300 K. All of the samples under study are characterized with intensive PL in the visible region of the spectra. The PL spectra combine features of both own luminescence of the LGO matrix and emission of the three charged dopants. Composition and intensity of the PL bands depend on the dopant's concentration, type and morphology of the samples.

Obtained results were compared with known literature data about single $\text{Li}_2\text{Ge}_7\text{O}_{15}$ crystals and nanosized powdered materials of the same composition.