

Luminescent properties of Eu ions doped $(1-x)(27\text{P}_2\text{O}_5-36\text{MoO}_3-5\text{Bi}_2\text{O}_3-32\text{K}_2\text{O})-x\text{KBi}(\text{MoO}_4)_2$ glasses and glass-ceramics

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Various oxide glasses and glass-ceramics have attracted significant attention as optical materials for applications in optoelectronics, such as displays, light-emitting diodes, temperature sensors, as well as active laser media. Some of glasses exhibit own photoluminescence (PL), but that emission is broadband, low intensity. Thus, it is therefore unsuitable for practical use. Doping with luminescent ions of transition or rare-earth metals enables significant improvement in the PL properties of glasses and glass-ceramics. Among the luminescent ions, the Eu^{3+} ones are known for their high PL intensity and narrow lines in the orange and red spectral regions (570–730 nm). These ions are perfect luminescent probes for the crystal/atomic structure of materials, as $^3\text{D}_0 \rightarrow ^7\text{F}_2$ electronic transitions are highly dependent (hypersensitive) on the symmetry of the local environment of the ion.

We report here our recent findings on the optical properties of $27\text{P}_2\text{O}_5-36\text{MoO}_3-5\text{Bi}_2\text{O}_3-32\text{K}_2\text{O}$ glasses, both pure and Eu^{3+} -doped, as well as glass-ceramics where the aforementioned glass is a host and powder of $\text{KBi}(\text{MoO}_4)_2:\text{yEu}$ micro/nanocrystals is a filler. The undoped glasses reveal relatively weak PL in the ultra-violet and visible spectral regions. The spectra of the PL were ascribed to the emission centers formed by bismuth ions and MoO_4 tetrahedra. The clear difference in Eu^{3+} -related emission spectra was observed for glasses, $\text{KBi}(\text{MoO}_4)_2:\text{yEu}$ and glass-ceramics. This result can be explained by the formation of an interphase layer in the glass-ceramics with a specific chemical composition and characteristic optical properties.

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