

Optical absorption and photoluminescence of lumonophore nanocomposites

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Abstract

The europium complex tris(dibenzoylmethane)(monophenanthroline)europium (III) (Eu(DBM)₃Phen) was successfully incorporated with different molar ratios into organic copolymer matrix of styrene:butylmethacrilate (1:1) (SBMA) via sol-gel process. Spin-coated thin films were obtained. The layers turn out to be transparent in optical range of investigation. Absorption and luminescence properties of a europium complex on each step of technology nanocomposites of the pure Eu(DBM)₃Phen complex powder, its solution with SBMA and the resultant thin films nanocomposites (NC) phosphors (SBMA - Eu(DBM)₃Phen) were investigated. The microscopic investigations of the morphology of the NC surface show that the dimensions of Eu(DBM)₃Phen particles, incorporated in the polymer matrix are less than 100 nm. The forbidden bands of NC were obtained. Photoluminescence (PL) spectra have been measured exciting with N₂-laser ($\lambda = 0.334 \mu\text{m}$) and they were revealed the radiative bands between the energy levels of the europium ions centered at 578, 590, 615, 652, and 705 nm and can be attributed to the spin forbidden f-f transitions $5D_0 \rightarrow 7F_i$ ($i = 0,1,2,3$ and 4), respectively.