Recombination luminescence of $LaPO_4$-Eu nanoparticles

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Introduction

Scintillation materials based on the lanthanum phosphate, activated by rare earth ions, find wide application in various fields. These materials use as luminophors for fluorescent lamps, plasma panels, etc. Recently the major attention is attracted for studying nanoparticles based on $LaPO_4$ including $LaPO_4$-Eu. Last draws attention as a luminophor with radiation in red field of a spectrum.

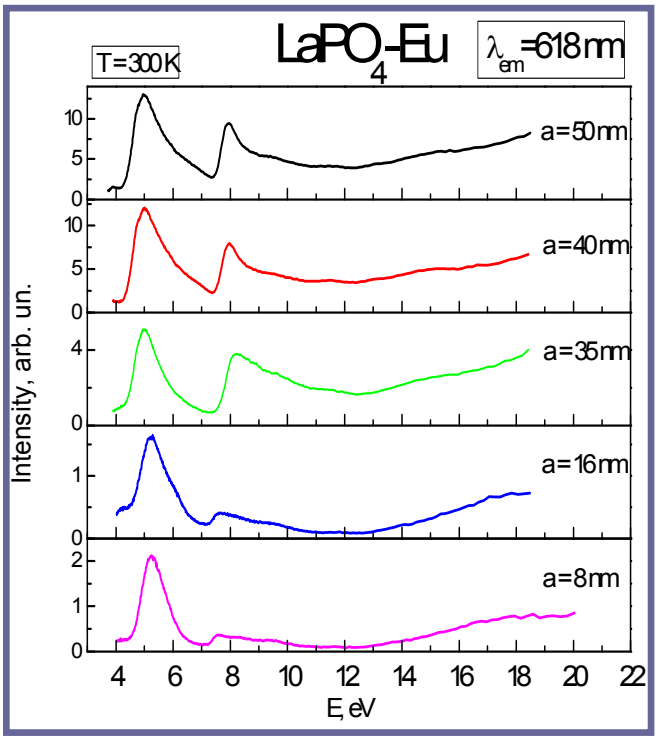

Fig. 2 Luminescence excitation spectra of LaPO4-Eu

Results

The X-ray diffraction analysis and scintillation data specify in existence of two crystalline symmetries depending on the size of nanoparticles (8, 16 nm - hexagonal; 35-50 nm - monoclinic). Depending on symmetry of nanoparticles the various structure of luminescence spectra is observed. For nanoparticles of the smaller sizes (8 and 16 nm, fig.3 curve 1,2) the energy shift of 0.28 eV for charge transfer band are observed effected by the change of symmetry of a crystalline lattice. With reducing nanoparticle size the kinetics of luminescence decay decreases, that can be explained by influence of surface defects.

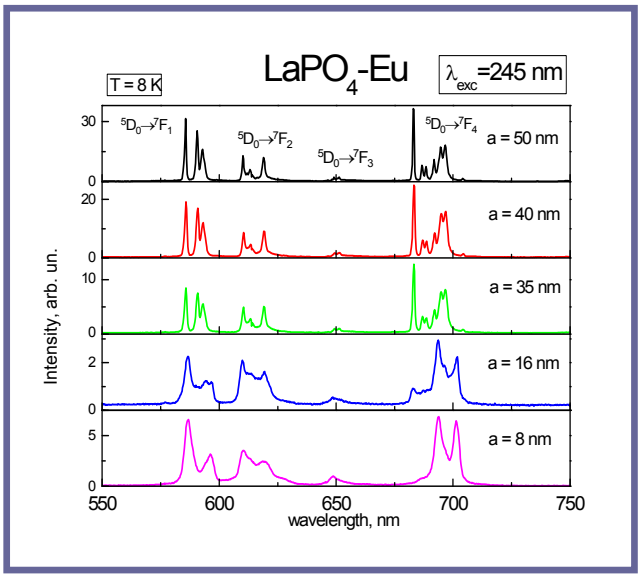

Fig. 1 Luminescence spectra of $LaPO_4$-Eu

Experiment

Polymer-mineral nanocomposites comprising of $LaPO_4$-Eu core and reactive functional shell were obtained via template synthesis in micelle-like structures formed by oligoperoxide surfactants in water solution. The luminescence measurements were performed at the SUPERLUMI station of HASYLAB at DESY.

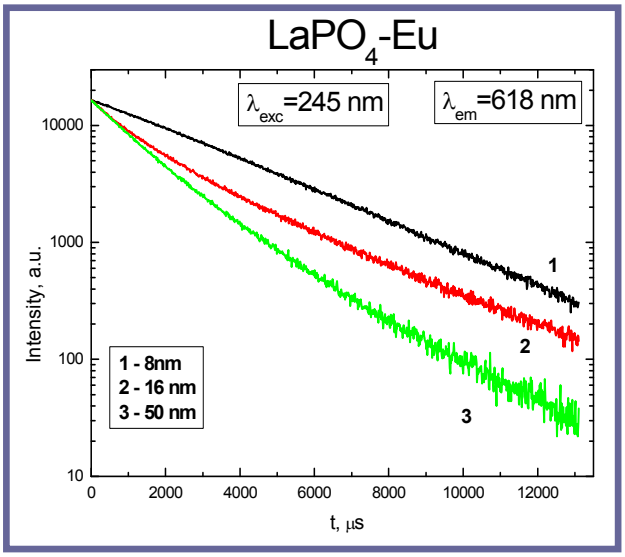

Fig. 3 Luminescence decay curves of $LaPO_4$-Eu nanoparticles: 1 - 50 nm, 2 -16 nm, 3 - 8 nm