LUMINESCENCE INVESTIGATION OF CHROMIUM AND CERIUM CO-DOPED YLuAG GARNETS: EFFECT OF DOPANT Ce^{+3} / Cr^{3+} RATIO

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Yttrium lutetium aluminium garnet (YLuAG) is a synthetic material that belongs to the garnet group. Synthetic garnet was first discovered in the 1950s, and since then the electronics industry has seen a rapid development of technologies using synthetic compounds with a garnet structure. YLuAG have good mechanical and optical properties. Cubic crystalline matrix allows incorporation in solid solution of luminescent ions such as transition metals (Cr^{3+}) and lanthanides (Ce^{3+}). Chromium and cerium co-doped YLuAG are widely used in luminescent systems such as phosphor-converted LEDs and scintillators. However, garnets doped with different amounts of luminescent metals show different results in luminescence properties. The measurements showed that even a small amount of chromium and cerium incorporated in garnets indicate luminescent properties. Ce^{3+} and Cr^{3+} co-doped YLuAG exhibit emission spectrum ranging from 480 nm to 830 nm, which almost covers full range of visible light and a slight shift towards the red light area. Due to that, it is a great candidate for white light LED lighting.

In the present work, garnets doped with different amounts of chromium have been synthesised and their structural and luminescence properties were studied. Ce^{3+} and Cr^{3+} co-doped YLuAG garnets were synthesized by the sol-gel method. The phase purity of the samples was analysed by means of X-ray diffraction. The morphology of the compounds was evaluated by using scanning electron microscopy. Photoluminescence properties such as emission and excitation spectra, decay curves, quantum efficiency have been investigated.

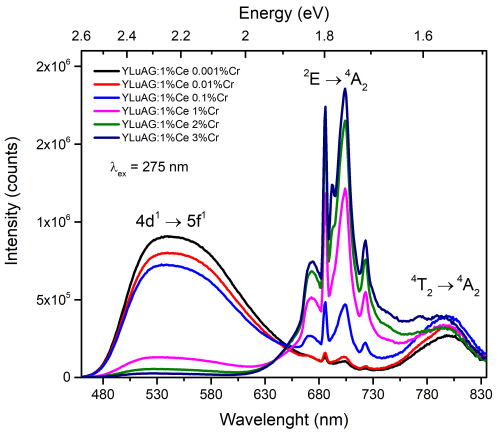

Fig. 1. Emission spectra of YLuAG co-doped with cerium and different amounts of chromium.