INVESTIGATION OF CERIUM AND BORON DOPED YTTRIUM AND LUTETIUM ALUMINUM GARNET CERAMICS

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In order to convert high-energy radiation, such as gamma or X-rays, into a visible light, a certain type of material is needed. Such compounds are usually referred to as scintillators. Over the years many different candidates to fit the requirements were examined. However, compounds with garnet structure have attracted a particularly large amount of attention [1]. Cerium doped yttrium and lutetium aluminum garnets (YAG:Ce, LuAG:Ce), have high density, high thermal stability, a rather intensive emission/excitation and high quantum efficiency which are needed for a good scintillator. However, further optimization and improvement is still needed especially on the shortening of the decay time. One way to approach this problem is to alloy the aforementioned compounds with different elements, such as boron and magnesium [2,3].

In this work we describe the synthesized YAG and LuAG garnets that are doped with 0.5% cerium that are additionally doped with 5% of boron and / or 0.03% of magnesium. The initial powders of garnets were synthesized Sol-Gel method. Ceramics were obtained using hydrostatic pressure. Boron and additional doping by magnesium are expected to improve required luminescent properties. Selected sol-gel method determines the homogeneity of compounds and low temperatures of synthesis. Phosphor coatings were analyzed by X-ray diffraction analysis and scanning electron microscopies. Emission, excitation spectra and decay times have been investigated as well.

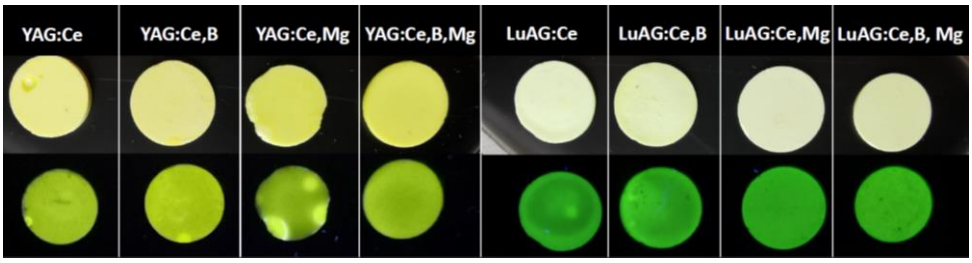

Fig. 1. Ceramics of different garnets in day light and under 365 nm excitation.

References

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