CHEMISTRY & CHEMICAL TECHNOLOGY

CONFERENCE 2023 VILNIUS

CONFERENCE BOOK

March 10, 2023
VILNIUS

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Sol-Gel Synthesis and Characterization of Novel Garnets with Various Stoichiometric Compositions

D. Vištorskaja[1*], A. Kareiva[1]

[1]*Institute of Chemistry, Faculty of Chemistry and Geosciences, Vilnius University, Naugarduko st. 24, LT-03225 Vilnius, Lithuania*

**diana.vistorskaja@chgf.vu.lt*

Synthetic garnets belong to a group of oxide crystals, which crystallize in the cubic lattice. Garnets doped with rare earth or transition metal are widely used in solid-state lasers [1]. The most popular synthetic garnet is the yttrium aluminium garnet ($Y_3Al_5O_{12}$, YAG). It has been recognized as one of the best phosphor host material due to its excellent chemical, optical and mechanical properties [2]. YAG materials activated with rare-earth or transition metal ions are perspective candidates for light-emitting diodes (wLEDs), cathode-ray tubes (CRTs), and scintillators. For example, YAG:Nd is well known as a lasing medium and was used in cosmetic surgery [1, 3]. Therefore, YAG-based phosphors have been widely studied in the application of displays, such as field emission display, vacuum fluorescent display, and plasma display panel [2-4]. Since numerous of these applications need materials in shape of films or powders with a high degree of purity, so several synthesis routes have been investigated. The sol-gel method is one of the most useful technique due to its advantages, such as low temperature and cost, achievement of monophasic and homogeneous multicomponent products [5].

The aim of this work was to synthesize novel $Y_{3-x}Na_xAl_5O_{12}$, $Y_{3-x}K_xAl_5O_{12}$, $Y_3Al_{5-y}V_yO_{12}$, $Y_{3-x}Na_xAl_{5-y}V_yO_{12}$ garnets with various stoichiometric compositions by a sol-gel method and to study them using X-ray diffraction (XRD) analysis, Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). Figure 1 shows the XRD patterns of the $Y_{3-x}Na_xAl_5O_{12}$ samples sintered at 1000 °C, with the different molar parts of sodium ($0.01 \leq x \leq 2$) in the compounds. All obtained results will be presented and discussed at the conference.

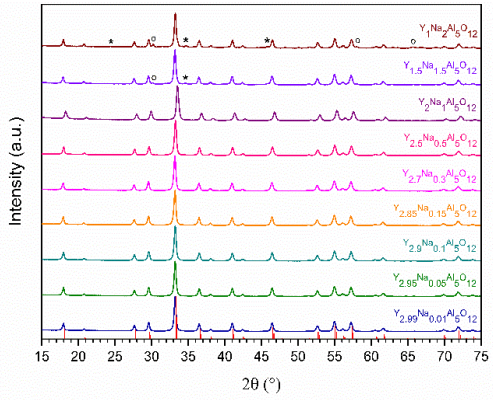

Fig. 1. XRD diffraction patterns of $Y_{3-x}Na_xAl_5O_{12}$ samples synthesized at 1000 °C. The crystalline phases are marked: vertical red lines - $Y_3Al_5O_{12}$ [PDF #96-152-9038], * - $YAlO_3$ [PDF #96-153-3070], o - Al_2O_3 [PDF #96-100-0443].

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