Vilnius
Ch
2025

CHEMISTRY AND CHEMICAL TECHNOLOGY 2025

Student Scientific Conference

May 9, 2025
NFTMC, Saulėtekio al. 3,
Vilnius

Vilniaus universitetas 1579 Universitas Vilnensis

ktu kauno technologijos universitetas 1922

Klaipėdos universitetas

CENTER FOR PHYSICAL SCIENCES AND TECHNOLOGY

Scientific committee

Doc. dr. Lina Mikoliūnaitė | VU (chairwoman)

Prof. dr. Aldona Beganskienė | VU

Doc. dr. Živilė Stankevičiūtė | VU

Doc. dr. Inga Grigoravičiūtė | VU

Doc. dr. Vaida Kitrytė-Syrpa | KTU

Prof. dr. Vytautas Getautis | KTU

Prof. dr. Saulius Grigalevičius | KTU

Doc. dr. Vilija Kederienė | KTU

Dr. Tadas Prasauskas | KTU

Dr. Žilvinas Kryževičius | KU

Prof. dr. Audronė Žukauskaitė | KU

Organizing committee

Dr. Lina Mikoliūnaitė | VU (chairwoman)

Dr. Greta Inkrataitė (secretary) | VU

Dr. Živilė Stankevičiūtė | VU

Dr. Inga Grigoravičiūtė | VU

Dr. Julija Grigorjevaitė | VU

Dr. Indrė Misiūnaitė-Vaškevičienė | VU

Dr. Anton Popov | VU

Dr. Agnė Kizalaitė | VU

PhD stud. Eglė Ežerskytė | VU

PhD stud. Gytautė Sirgėdaitė | VU

PhD stud. Justinas Januškevičius | VU

ISSN 2538-7332 (digital), DOI https://doi.org/10.15388/CCT.2025

LUMINESCENCE PROPERTIES OF CHROMIUM DOPED YAG AND YLuAG: INFLUENCE OF Cr^{3+} CONCENTRATION

Nerija Ričkutė*, Greta Inkrataitė, Ramūnas Skaudžius

Institute of Chemistry, Faculty of Chemistry and Geosciences, Vilnius University, Vilnius, Lithuania
**nerija.rickute@chgf.stud.vu.lt*

Yttrium aluminium garnet (YAG) and yttrium lutetium aluminium garnet (YLuAG) are synthetic materials that belong 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. YAG and YLuAG have good mechanical and optical properties. This matrix allows incorporation in solid solution of luminescent ions such as transition metals (Cr^{3+}). Chromium doped YAG and YLuAG have different luminescence properties due to their structural differences and effect on crystal field, they are both widely used in luminescent systems. YAG is an excellent host for high power solid-state lasers due to its high density, high thermal stability, relatively efficient luminescence processes and high quantum efficiency. YLuAG, on the other hand, is often used in phosphor-converted LEDs and scintillators due to its great optical properties. However, garnets doped with different amounts of chromium show different results in luminescence properties. The measurements showed that even a small amounts of chromium incorporated in garnets indicate luminescent properties such as emission in NIR region, which is highly significant for applications in NIR-LED construction, horticulture and theranostics. This enables excellent results in luminescence with only a small amount of Cr^{3+}.

In the present work, garnets doped with different amounts of chromium have been synthesised and their structural and luminescence properties were studied. Cr^{3+} doped YAG and YLuAG 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. Elemental analysis was carried out using inductively coupled plasma optical emission spectrometry. Photoluminescence properties such as emission and excitation spectra, decay curves, quantum efficiency have been investigated.