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PREPARATION OF Sm^{3+} IONS DOPED MgAl_2O_4 BY SOL-GEL POLYACRYLAMIDE SYNTHESIS

Pranga Prava Mandal^{1*}, Dovydas Karoblis¹, Aivaras Kareiva¹

¹ Faculty of Chemistry and Geosciences, Institute of Chemistry, Vilnius University, Lithuania

*prava.mandal@chg.f.stud.vu.lt

Luminescence is the emission of light from a substance that has absorbed energy, distinct from the light emitted due to heat. Specifically, it occurs when an electronically excited species, not in thermal equilibrium with its surroundings, spontaneously releases radiation. This process involves the absorption of energy, which elevates electrons to higher energy levels, followed by the emission of that energy as photons of light when the electrons return to their ground state. Essentially, luminescent materials convert absorbed energy into light emission (photons). This is known as excitation and emission. Luminescent materials are composed of a different matrix and an activator (usually transition element or lanthanide). Many different classes of materials can be used as matrices, including perovskites, pyrochlores, spinels, etc. In our experiment we are using MgAl_2O_4 spinel material as a matrix, which displays properties such as high hardness and mechanical strength, high melting point and good thermal shock resistance, wide optical transparency and a chemical inertness. While many different lanthanide ions, like Eu^{3+} [1], Ho^{3+} [2], have already been doped into the magnesium aluminate structure, there is no work regarding the Sm^{3+} substitution for this spinel for MgAl_2O_4 , which was prepared by sol-gel method using either EDTA or mixture between the EDTA and polyacrylamide. In this work, we investigated the possible Sm^{3+} ions doping into the MgAl_2O_4 system.

The MgAl_2O_4 spinel was synthesized by a sol-gel method, using either EDTA or the mixture between the EDTA and polyacrylamide. Both methods allow to prepare phase-pure MgAl_2O_4 compounds across a wide temperature range, from 700 °C to 1200 °C, with a notably short annealing time of two hours. It was observed that small amounts of Sm^{3+} ions doping nearly up to 1 mol % did not produce any impurity phases. The resulting compounds were thoroughly characterized using a variety of analytical techniques, including X-ray diffraction, scanning electron microscopy (SEM), and Fourier-transform infrared (FTIR) spectroscopy. SEM analysis revealed a direct correlation between increasing temperature and increased particle size. FTIR spectroscopy confirmed the formation of the spinel structure.

Literatūros sąrašas

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