

Kususana Yaworasan 2012: The Effects of Irradiation on Characteristics of MgAl_2O_4 Spinel. Master of Science (Physics), Major Field: Physics, Department of Physics. Thesis Advisor: Mr. Wiwat Wongkokua, Ph.D. 93 pages.

In this work, the effect of irradiation on characteristics of MgAl_2O_4 spinel was studied by measuring the absorption of light using UV-Vis-NIR and FT-IR spectrometers. The irradiation doses were varied as 10 kGy, 20 kGy and 30 kGy respectively. There was some change of absorption spectra intensities which correspond to the transition metal ions which was defect of spinel crystal. The changed was resulted in the color change of spinel.

By measuring optical absorption and color indices showed some changed in the Fe^{2+} to Fe^{3+} , which caused a decrease in the blue color of the spinel while the Cr^{3+} reduced or almost remain constant. For FT-IR technique, there were two close absorption region found in the range $700\text{-}400\text{ cm}^{-1}$. The first region caused by stretching mode of $\text{Fe}^{2+}\text{-O}^{2-}$ at tetrahedral site found at higher frequency ν_1 . The intensity reduced but stayed constant in frequency. The second region ν_2 found at lower frequency caused by $\text{Fe}^{3+}\text{-O}^{2-}$, $\text{Cr}^{3+}\text{-O}^{2-}$ at octahedral site. The absorption band moves towards lower or higher due to changes in bond lengths within the metal nuclear $\text{M}_{\text{octahedral}}\text{-O}^{2-}$ which is related to the strength of the bond.

Spinels in this study also showed luminescence which was absorbed in the range of 670-700 nm. The stretching mode of O-H bond of water molecules due to the absorption of water at the spinel surface was also found.

Student's signature

Thesis Advisor's signature