

Joint CQSE and CASTS Seminar

Weekly Seminar
Oct. 3, 2014 (Friday)

TIME Oct. 3, 14:30 ~ 15:30
TITLE Emission Spectroscopy of Luminescent Crystals Containing Rare Earth Elements
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Abstract

We have studied the emission spectroscopy of luminescent crystals containing rare earth elements such as KEuGe_2O_6 , $\text{Cs}_3\text{EuSi}_6\text{O}_{15}$, $\text{K}_4[(\text{UO}_2)\text{R}_2(\text{Ge}_2\text{O}_7)_2]$ ($\text{R} = \text{Eu}$ or Sm), and $\text{R}_2(\text{CHDC})_3$ ($\text{R} = \text{Y}$, Tb , or Eu , $\text{CHDC} = \text{C}_8\text{H}_{10}\text{O}_4$, cyclohexanedicarboxylate). These crystals were synthesized by either hydrothermal or solid-state methods, and their X-ray diffraction (XRD) data were obtained to determine the crystal structures as well as to confirm their purity. We have recorded the photoluminescence (PL) spectra, excitation spectra, and emission decay curves of these compounds. Based upon the spectroscopic data, in addition to the structural information, interesting energy transfer processes were observed in these crystals. In $\text{R}_2(\text{CHDC})_3$, the energy transfer from Tb^{3+} to Eu^{3+} was found to be unidirectional, whereas the concentration quenching phenomena were also clearly observed in these compounds. Interestingly, for the PL of $\text{K}_4[(\text{UO}_2)\text{R}_2(\text{Ge}_2\text{O}_7)_2]$ compounds, an efficient uranyl sensitization was observed in the compound containing Eu^{3+} , but not in the compound containing Sm^{3+} . The PL quenching caused by mixing Sm^{3+} in the $\text{K}_4[(\text{UO}_2)\text{Eu}_x\text{Sm}_{2-x}(\text{Ge}_2\text{O}_7)_2]$ compounds is similar to the Nd^{3+} mixing in $\text{KEu}_x\text{Nd}_{1-x}\text{Ge}_2\text{O}_6$ compounds due to the ligand energy transfer and the formation of dark sites.

