Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION VII
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 17-19. September 2018.

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INV-OGE 3

Detection of high pressure phase transitions in RE^{3+} doped Y_2O_3 and Y_2MoO_6 through luminescence measurements

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Rare earth ions (RE^{3+}) are highly sensitive to local symmetry so changing the symmetry is reflected in their luminescence spectra. In this work we investigated the high pressure photoluminescence properties of cubic and monoclinic Y_2O_3, as well as, monoclinic Y_2MoO_6, doped either with Eu^{3+} or Sm^{3+} ions.

Photoluminescence emission of cubic Y_2O_3:Sm^{3+} and Y_2O_3:Eu^{3+} phases were recorded up to the pressure of 20 GPa and 15 GPa, respectively. With varying pressure, the intensity ratio of $^4G_{5/2} \rightarrow {}^6H_{7/2}$ and $^4F_{3/2} \rightarrow {}^6H_{7/2}$ Sm^{3+} emission shows three distinct regions. Furthermore, the intensity ratio of $^5D_0 \rightarrow {}^7F_1$ and $^5D_0 \rightarrow {}^7F_2$ Eu^{3+} emission of the cubic matrix has similar pressure dependence as Sm^{3+} doped phase. A steep pressure dependence evident in the range of 9.2-13.1 GPa could be used for detecting a pressure induced cubic to monoclinic phase transition of Y_2O_3 matrix. It matches well the behavior of the pressure sensitive Sm^{3+} spectra in the range of 9.1-11.6 GPa, which is proven to appear due to a phase transition at ~ 11 GPa.

The monoclinic Y_2O_3:Eu^{3+} also has a pressure-sensitive intensity ratio of $^5D_0 \rightarrow {}^7F_1$ and $^5D_0 \rightarrow {}^7F_2$ emission lines. Measurements for the monoclinic Y_2O_3:Eu^{3+} matrix were recorded up to 8 GPa. The dependence is unambiguous, without any phase transitions in the measured region. The nature and high sensitivity suggests that this dependence can be used as an efficient high pressure sensor.

Photoluminescence emission measurements of Y_2MoO_6:Sm^{3+} and Y_2MoO_6:Eu^{3+} phases were recorded up to 12 and 11.5 GPa, respectivelly. Intensity ratio variation of $^4G_{5/2} \rightarrow {}^6H_{5/2}$ and $^4G_{5/2} \rightarrow {}^6H_{7/2}$ Sm^{3+} emission lines, as well as of $^5D_0 \rightarrow {}^7F_1$ and $^5D_0 \rightarrow {}^7F_2$ Eu^{3+} emission lines as a function of pressure can be also used for detection of the Y_2MoO_6 phase transition. The accomplished results demonstrate the properties of Y_2MoO_6:Sm^{3+} and Y_2MoO_6:Eu^{3+} inorganic phosphors, with emmision linear dependance of the intensity ratio on the pressure up to 8 GPa, could be used as an efficient high pressure sensor.

INV-OGE 4

Optical and stryctural properties of nanostructured semiconductors

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Science and technologyof nanostructures is a broad and interdisciplinary area of research and development activity that has been growing explosively worldwide in the past decade. Ongoing studies cover not only basic research but also the broad applications range.