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Luminescence based on energy transfer in xerogels doped with $Tb_{2-x}Eu_x(WO_4)_3$

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Abstract

A series of luminescent materials consisting of $Tb_{2-x}Eu_x(WO_4)_3$ entrapped in silica xerogel were successfully prepared. The parameter x in the formula changed from 0.4 to 2. Spectroscopic properties such as absorption and luminescence of optically active ions were studied at room temperature. Owing to the energy transfer from the WO_4^{2-} groups (ligand-metal charge transfer, (LMCT)) the lanthanide ions show their characteristic emissions in $Tb_{2-x}Eu_x(WO_4)_3$ entrapped in silica xerogel, *i.e.*, $^5D_0 \rightarrow ^7F_J$ ($J = 0, 1, 2, 3, 4$) transition for Eu^{3+} ion and $^5D_4 \rightarrow ^7F_J$ ($J = 6, 5, 4, 3$) transition for Tb^{3+} ion. The energy transfer is effective for the mixed tungstate salt $Tb_{1.35}Eu_{0.65}(WO_4)_3$ entrapped in silica xerogel. The $Eu(III)$ emission intensity in the materials under study increases with an increase in the annealing temperature from 600 to 900 °C. This is due to the removal of the effective O-H quenchers from the coordination sphere of the $Eu(III)$ ion.



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