Sonochemical synthesis of highly luminescent Ln_2O_3:Eu_{3+} (Y, La, Gd) nanocrystals.

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Streszczenie

Sonication of $Ln(CH_3COO)_3 \cdot H_2O$, $Eu(CH_3COO)_3 \cdot H_2O$ and NaOH dissolved in the ionic liquid-butyl-3-methylimidazolium bis(trifluoromethane)sulfonylamide lead to $Ln(OH)_3$:Eu (Ln: Gd, La, Y) nanoparticles. Subsequent calcination at 800°C for 3h allowed to obtain Ln_2O_3:Eu nanopowders. Gd_2O_3 and Y_2O_3 were obtained in the C-type lanthanide sequioxide structure, whereas La_2O_3 crystallized in the A-type. Structure, morphology, and luminescent properties of the nano-oxides were investigated by powder X-ray diffraction (PXRD), scanning electron microscopy (SEM), dispersive X-ray (EDX), and photoluminescence (PL). SEM studies revealed that the synthesized Gd_2O_3:Eu, La_2O_3:Eu, and Y_2O_3:Eu formed nano-spindle, -sheets, and -rods in shape, respectively. The nanoscale materials show very efficient red emission due to the intraconfigurational f-f transitions of Eu^{3+}. The quantum yields for Ln_2O_3:Eu (5%) were determined to be 4.2% for Ln=Gd, 13.8% for Ln=Y and 5.2% for Ln=La. The asymmetric ratio I_{02}/I_{01} of Eu^{3+} varies from 5.3 for Gd_2O_3, to 5.6 for Y_2O_3 to 6.5 for La_2O_3, which increased the color chromaticity.

Słowa kluczowe

ceramics, inorganic compounds, nanostructures, oxides, photoluminescence spectroscopy

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