Microstructure and spectroscopy of Lu_2O_3 : Eu prepared using various synthesis techniques.

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Streszczenie

Nanocrystalline powders of Lu2O3:Eu with activator content varying between 0.2%-10% were prepared using four different methods of synthesis. The products differed in their microstructure and crystallites sizes. Combustion of Lu(NO3)3 with urea produced strongly agglomerated material, most probably with significantly non-uniform distribution of the Eu3+ dopant. Replacing urea with glycine for the combustion produced only slightly agglomerated, voluminous, fluffy powder. Applying the Pechini technique resulted in significantly agglomerated powder while the homogeneous precipitation of Lu(OH)3 with urea at 90 °C and its subsequent decomposition to Lu2O3 at 650 °C resulted in a powder of perfectly spherical particles with a uniform size of about 130 nm with very low agglomeration. The efficiency of X-ray excited luminescence of our nanocrystalline Lu2O3:5%Eu was compared to that of the commercial microcrystalline Gd2O2S:Eu. It was found that the commercial phosphor performed four times more efficiently than our nanocrystalline powder. We consider this to be rather encouraging as the fabrication of our powder is not optimized yet. It seems that Lu2O3:Eu, even in nanocrystalline form, can perform much more efficiently which would make it a promising X-ray phosphor.