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Influence of Sintering Temperatures in $Er^{3+}/Yb^{3+}/Tm^{3+}$ Tri-Doped Y_2O_3 Nanophosphors

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Abstract : The $Er^{3+}/Yb^{3+}/Tm^{3+}$ tri-doped Y_2O_3 nanophosphors were synthesized by solvothermal method and its temperature dependence of the white upconversion emission has been studied by using 975 nm laser diode. The upconversion emission spectra in 1 mol% Er^{3+}/5 mol% Yb^{3+}/xTm^3 tri-doped Y_2O_3 nanophosphors sintered at 1000 °C with x from 0 to 0.5 mol%. The blue emission intensity increase with Tm^{3+} concentration from 0 to 0.5 mol%, it is due to the 2F7/2→2F5/2 transition of Yb^{3+} around 10,000 cm-1 could easily reach the Tm^{3+} sates. The white light is composed with the blue (1G4→3H6 of Tm^{3+}), green (2H11/2, 4S3/2→4I15/2 of Er^{3+}), and red (4F9/2→4I15/2 of Er^{3+}) upconversion radiations. The Y_2O_3: $Er^{3+}/Yb^{3+}/Tm^{3+}$ nanophosphors show from white to green upconversion emission at power of 600 mW/cm² as sintering temperature increased. The calculated Commission Internationale de l'Eclairage (CIE) coordinates can be located in the white area with various sintering temperatures, in sintered at 1000 °C, and their color coordinates are very close to the standard white-light emission (0.33, 0.33). Their upconversion processes were explained by measuring the upconversion luminescence spectra and pump power dependence and energy level diagram.

Keywords : white upconversion emission, nanophosphors, energy transfer, solvothermal method
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