Upconversion luminescence properties of Er3+/Yb3+ in transparent alpha-Sialon ceramics

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Optical Materials. 2015 Vol. 39, Pp: 239-246

Abstract

Er3+ stabilized transparent (alpha-Sialon ceramics with upconversion (UC) luminescence properties were fabricated for the first time by press sintering method. The fabricated samples show better transparency as well as UC luminescence properties. Moreover, the effect of Yb2O3 as a sensitizer on UC properties was analyzed in Er-alpha-Salon system. The chance in Sialon phases and crystal structure were analyzed by X-ray diffraction. The chemical compositions and morphology of grains and intergranular phase were analyzed by EDS and Transmission Electron Microscopy, respectively. The UC emissions were observed around 527, 547 and 670 nm corresponding to the H-2 (11/2), S-4 (3/2) and E-4 (9/2) transitions, respectively when excited by 980 nm continuous wave (CW) laser diode. UC process in Er3+ is found to be two photon processes. Intense green UC luminescence was observed with Er3+ and low amount of Yb3+ addition but higher amount of Yb3+ addition shows higher UC luminescence in red region. The transparency was higher in higher Er2O3 and low Yb2O3 content Sialon tha was found 60% in visible light region. The chromaticity was also calculated for different samples and high color purity above 90% was obtained for green and yellow emissions. The mechanical properties were also investigated in this study.