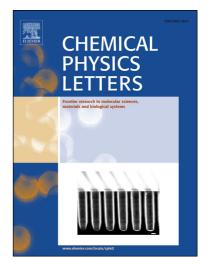
## Accepted Manuscript

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## Photon avalanche upconversion in Ho<sup>3+</sup>-Yb<sup>3+</sup> co-doped transparent oxyfluoride glass-ceramics

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## Abstract

The Ho<sup>3+</sup>-Yb<sup>3+</sup> co-doped transparent glass and glass-ceramics containing CaF<sub>2</sub> nanocrystals have been prepared. Differential thermal analysis and X-ray diffraction measurements have been made to characterize thermal properties of glass and structural changes in glass-ceramics, respectively. Photon avalanche upconversion has been achieved by exciting the samples at 745 nm at room temperature. An intense green and a weak red upconverted emissions corresponding to the  ${}^{5}S_{2}$ :  ${}^{5}F_{4} \rightarrow {}^{5}I_{8}$  and  ${}^{5}F_{5} \rightarrow {}^{5}I_{8}$  transitions, respectively, have been observed. The upconversion intensity has been found to increase with the increase in the size of the fluoride nanocrystals in glass-ceramics. Experimental evidences confirm that the mechanism of upconversion is photon avalanche.

**Keywords:** Oxyfluoride glasses; Glass-ceramics; Ho<sup>3+</sup> and Yb<sup>3+</sup> ions; Upconversion; Photon

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avalanche.

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