

# Crystal structure and upconversion luminescence properties of Er<sup>3+</sup>

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## Abstract

This paper gives the properties of upconversion photoluminescence (UCPL) on SrLaMgTaO<sub>6</sub> crystal doped with trivalent erbium at concentrations of 1 ~ 20 mol% were prepared by a solid state reaction process from powder based precursors. The crystal structure, electronic structure, and optical properties of SrLa<sub>(1-x)</sub>MgTaO<sub>6</sub>:Er<sup>3+</sup><sub>x</sub> were studied by using X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), UV-visible spectrophotometer, DFT (density functional theory) calculations and photoluminescence (PL) spectra. Under the excitation of a 975 nm laser diode, the phosphors emitted green (<sup>2</sup>H<sub>11/2</sub>, <sup>4</sup>S<sub>3/2</sub>→<sup>2</sup>I<sub>15/2</sub>) and red (<sup>4</sup>F<sub>9/2</sub>→<sup>2</sup>I<sub>15/2</sub>) UCPL[1]. Under the Er<sup>3+</sup> concentration of 10 mol %, the intensity of the green UCPL was increased in linear proportion to Er<sup>3+</sup> concentration, which was attributed that the UCPL of low concentration of Er<sup>3+</sup> in SrLaMgTaO<sub>6</sub> was mostly generated from ESA process. From higher Er<sup>3+</sup> concentration above 10 mol%, however, the ETU process had additionally participated to UCPL, the intensity of UCPL was decreased. It was attributed that the concentration quenching was more active than ETU process at high concentration of Er<sup>3+</sup> in SrLaMgTaO<sub>6</sub>.

## References

[1] Li Y H, Hong G Y, Zhang Y M, et al, J. Alloys and Compounds, 456(2008), 247–250.

## Figures

