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Unraveling the correlation between oxide-ion motion and upconversion luminescence in β-$La_2Mo_2O_9$:Yb^{3+}, Er^{3+} derivatives

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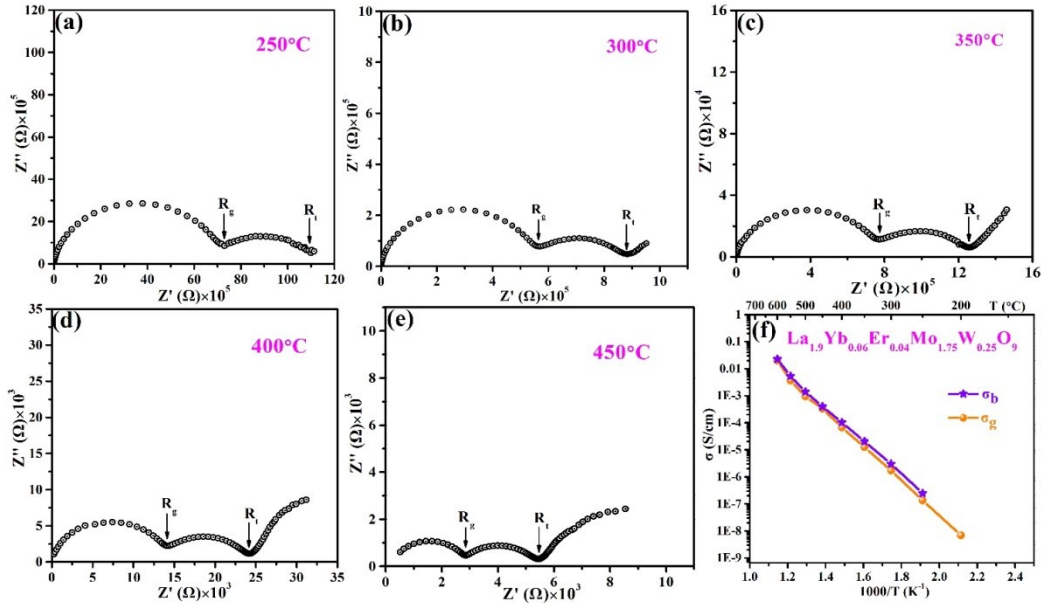

Fig. S1 Complex impedance plots for at (a) 250 °C (b) 300 °C (c) 350 °C (d) 400 °C (e) 450°C of $La_{1.9}Yb_{0.06}Er_{0.04}Mo_{1.75}W_{0.25}O_9$; (f) Temperature dependency of the grain and boundary electric conductivity of $La_{1.9}Yb_{0.06}Er_{0.04}Mo_{1.75}W_{0.25}O_9$.

It is reported that pure $LaGaO_3$ perovskite has no oxide-ion conduction, while it is good oxide-ion conductor when doping with Mg^{2+}.[1-4] Actually, $La_{0.95}Yb_{0.03}Er_{0.02}Ga_{1-z}Mg_zO_3$ material shows no apparent break point for the sample without Mg dopant and those with Mg dopant show break points, as depicted in Fig.S2.

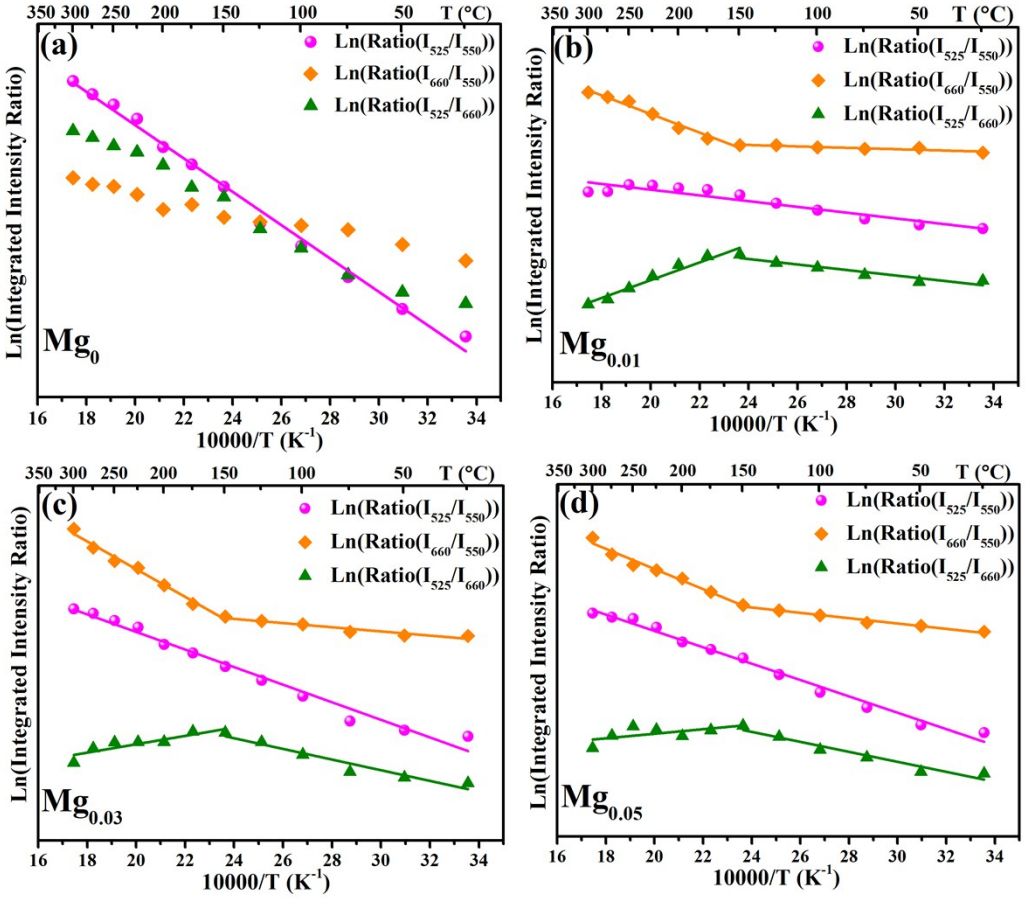

Fig. S2 Logarithmic plot of the intensity ratio of $I_{525}/I_{550}(Ln(Ratio(I_{525}/I_{550})))$, $I_{660}/I_{550}(Ln(Ratio(I_{660}/I_{550})))$ and $I_{525}/I_{660}(Ln(Ratio(I_{525}/I_{660})))$ as a function of inverse absolute temperature of $LaGa_{1-z}Mg_zO_3$(z=0, 0.01, 0.03, 0.05). The lines are fitted.

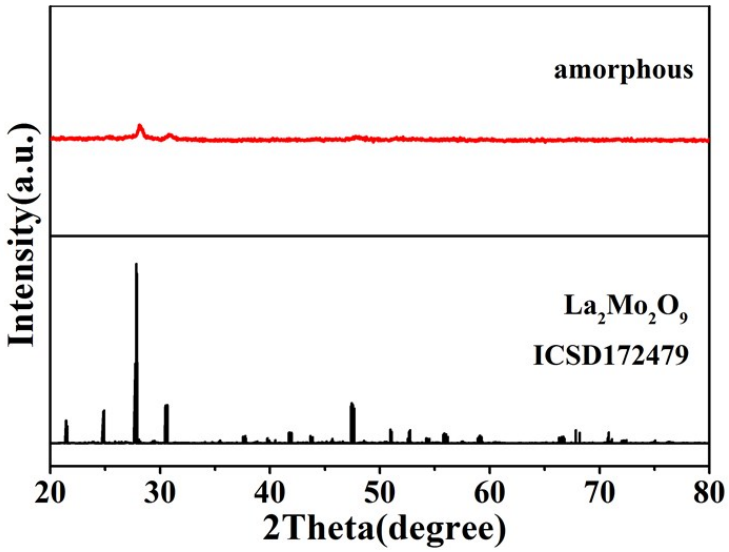

Fig. S3 XRD patterns of amorphous La_2O_3-Yb_2O_3-Er_2O_3-MoO_3, sample recorded at room temperature, along with the reference of monoclinic α-$La_2Mo_2O_9$ (ICSD172479).

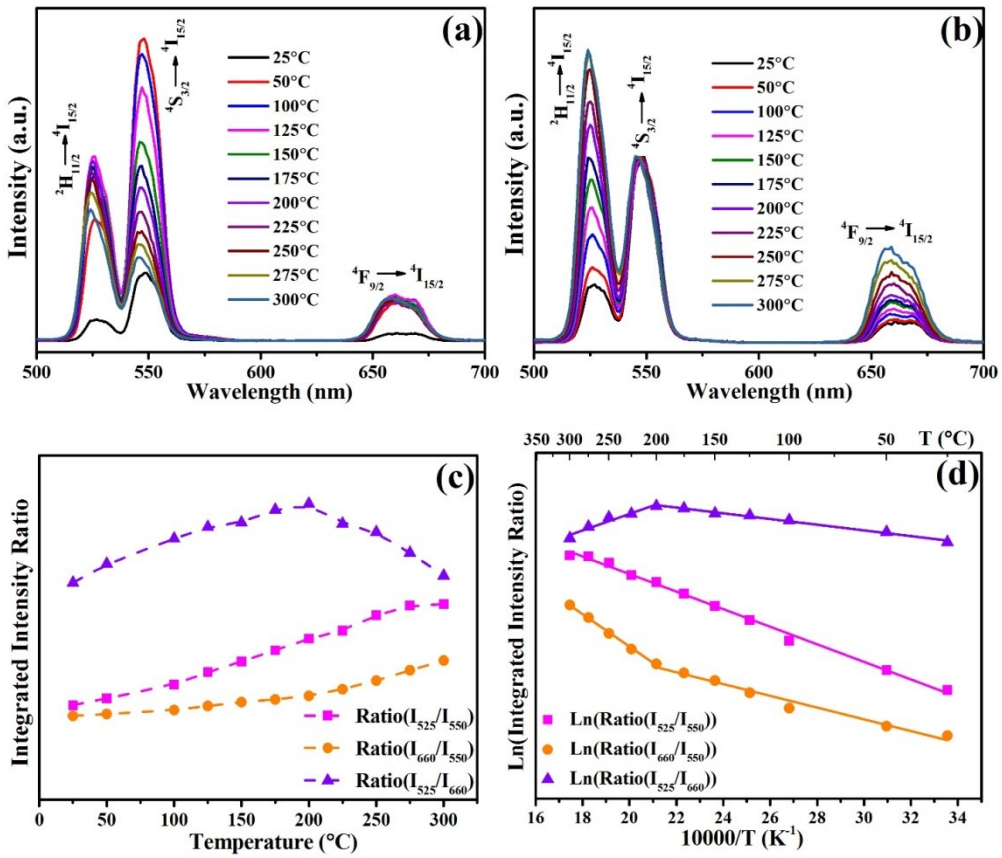

Fig. S4 (a) Temperature-dependent UC emission spectra of amorphous La_2O_3-Yb_2O_3-Er_2O_3-MoO_3 from room temperature to 300°C under excitation of a 980nm laser beam; (b) the same spectra with normalization at 550nm peak. (c) Variations of the integrated UC emission intensity ratios of amorphous La_2O_3-Yb_2O_3-Er_2O_3-MoO_3, i.e., Ratio(I_{525}/I_{550}) (pink square, fitted line), Ratio(I_{660}/I_{550}) (orange circle), and Ratio(I_{525}/I_{660}) (violet up-triangle) (the lines are to guide the eye), with temperature; (d) Lognormal plots of the intensity ratio of I_{525}/I_{550}(Ln(Ratio(I_{525}/I_{550}))), I_{660}/I_{550}(Ln(Ratio(I_{660}/I_{550}))) and I_{525}/I_{660}(Ln(Ratio(I_{525}/I_{660}))) as a function of inverse absolute temperature of amorphous La_2O_3-Yb_2O_3-Er_2O_3-MoO_3, the lines are the fitted.

References

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