Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

The reported anomalous emission intensity of the $^5D_0 \rightarrow {}^7F_4$ transition of Eu^{3+} in a molybdate double perovskite

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Supporting Information

1. Synthesis of samples

The synthesis method followed that of Ye et al.[1] Stoichiometric amounts, according to each chemical formula, of $SrCO_3$ (99.995%), $CaCO_3$ (>99.999%), MoO_3 (99.98%), Eu_2O_3 (99.999%), Yb_2O_3 (>99.99%), Li_2CO_3 (99.997%), WO_3 (99.995%) and MnO_2 (99.99%), all purchased from Sigma-Aldrich were mixed and ground thoroughly for solid state calcination in a furnace at different high temperatures for fixed periods of time, step by step: (i) 600 ^oC for 5 h, (ii) 1000 ^oC for 5 h, and (iii) 1150 ^oC for 20 h, with intermediate grinding between the steps.

The samples prepared were:

$Sr_2Ca_{0.88}Eu_{0.02}Yb_{0.04}Li_{0.06}MoO_6$,

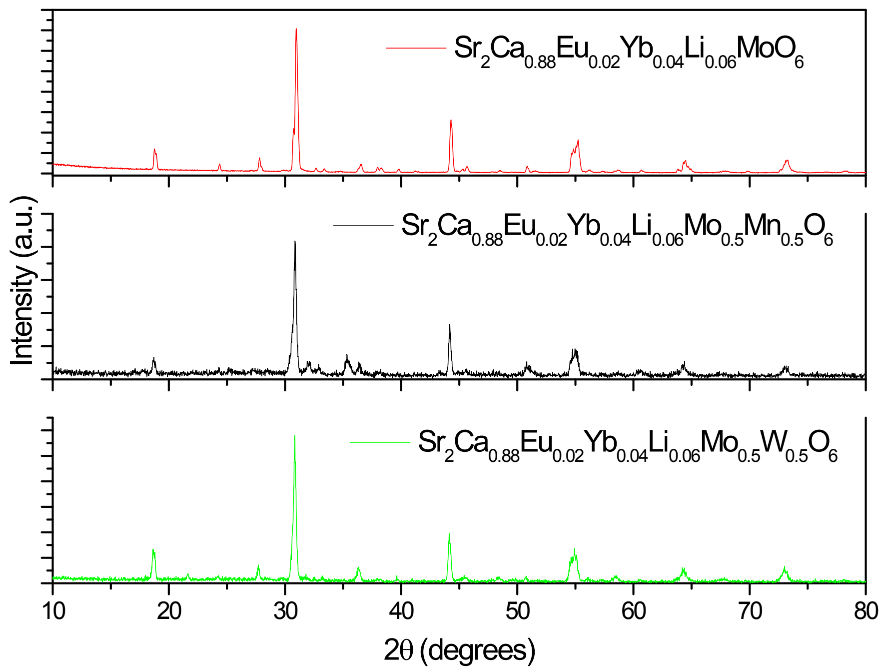
$Sr_2Ca_{0.88}Eu_{0.02}Yb_{0.04}Li_{0.06}Mo_{0.5}W_{0.5}O_6$,

$Sr_2Ca_{0.88}Eu_{0.02}Yb_{0.04}Li_{0.06}Mo_{0.5}Mn_{0.5}O_6$, and

$Sr_2Ca_{0.88}Eu_{0.02}Yb_{0.04}Li_{0.06}WO_6$.

2. Characterization of samples

Selected X-ray diffractograms are displayed below and are similar to the results of Ye et al.[1]



3. Instrumentation

Photoluminescence measurements were conducted by using an Edinburgh FLS920 steady-state photoluminescence spectrometer with UV-Visible and NIR detectors, as well as a 0.5 W 980 nm diode laser system. Emission lifetimes were measured by a Nd:YAG ns pulsed laser, wavelength: 355 nm, pulse width: 10 ns, repetition frequency: 10 Hz, peak power: ~3.8 mJ, with a PMT detector and a Tektronics DPO 4104B oscilloscope.

Table S1. Literature data for energy of lowest $^7F_4$ level and $^5D_0$ level of Eu^{3+} in selected lattices.[11]

System	Lowest $^5D_4$ level (cm^{-1})	$^5D_0$ level (cm^{-1})	Highest energy $^5D_0 \rightarrow {}^7F_4$ transition (nm)
$LaCl_3$:Eu^{3+}	2751	17267	688.9
LaF_3:Eu^{3+}	2775	17290	688.9
EuF_3	2775	17290	688.9
$EuCl_3.6H_2O$		17260	
Y_2O_3:Eu^{3+}	2672	17221	687.3
Gd_2O_3:Eu^{3+}	2748	17283	688.0
Y_2O_2S:Eu^{3+}	2583	17143	686.8
YVO_4:Eu^{3+}	2700	17183	690.5
YPO_4:Eu^{3+}	2752	17211	691.6
$Y_3Al_5O_{12}$:Eu^{3+}	2856	17220	696.2
$Eu_3Ga_5O_{12}$	2448		
KY_3F_{10}:Eu^{3+}	2748	17269	688.7
$Cs_2NaEuCl_6$	2674	17220	687.5