Electronic Supplementary Material (ESI) for Dalton Transactions.

Supporting Information

Bilayer Stabilized Ln^{3+}-doped $CaMoO_4$ Nanocrystals with High Luminescence Quantum Efficiency and Photocatalytic Properties

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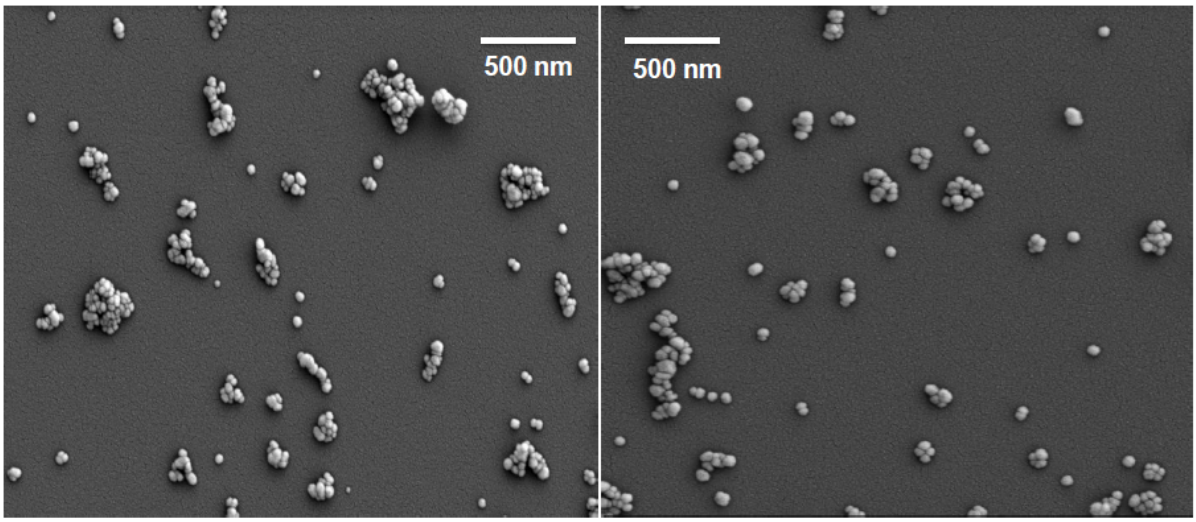

Fig. S1 SEM images of $CaMoO_4:Eu^{3+}$ nanocrystals.

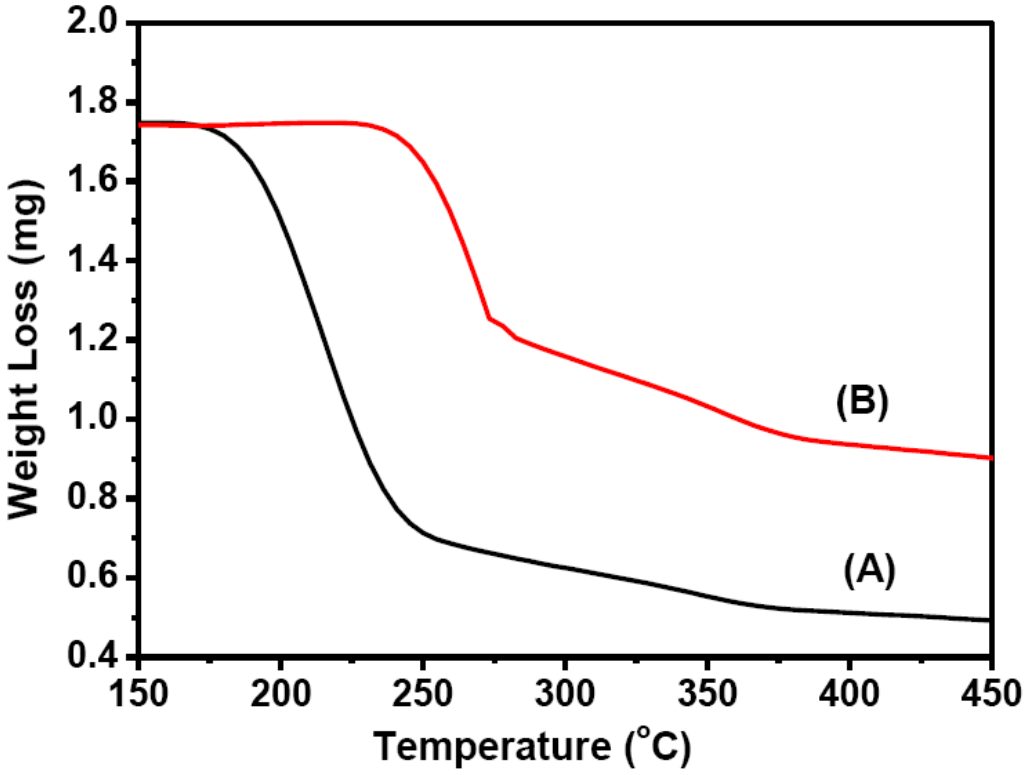

Fig. S2 TGA decomposition curves for (A) free SDS and (B) SDS capped nanocrystals in H_2O.

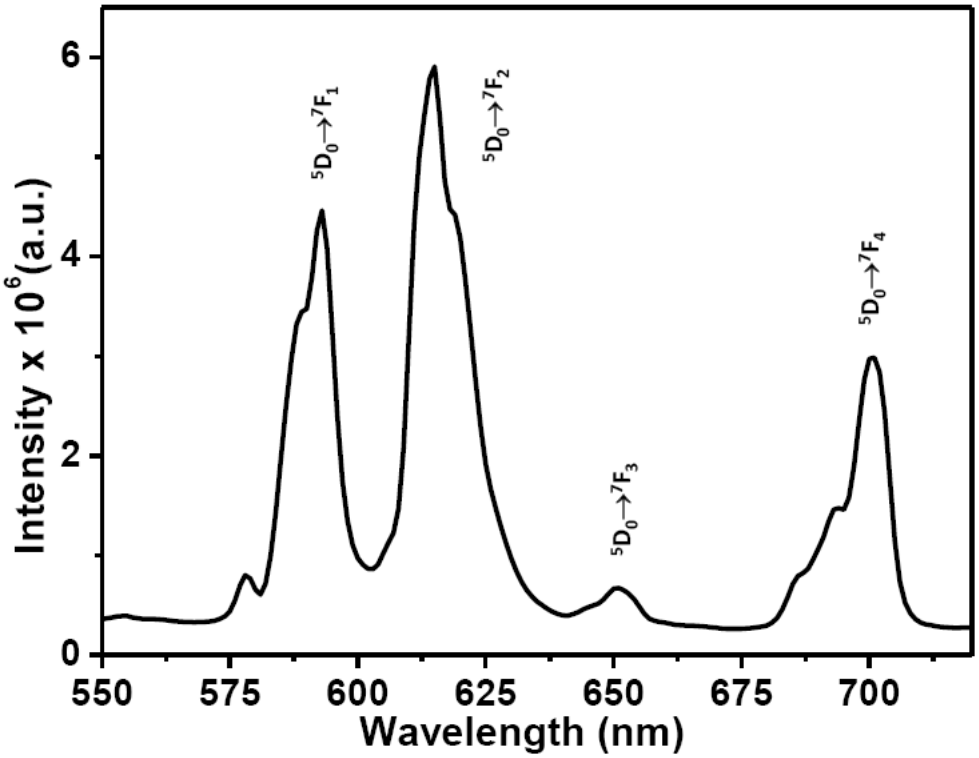

Fig. S3 Emission spectrum of Eu^{3+}-doped $CaMoO_4$ nanocrystals prepared using sol-gel method.

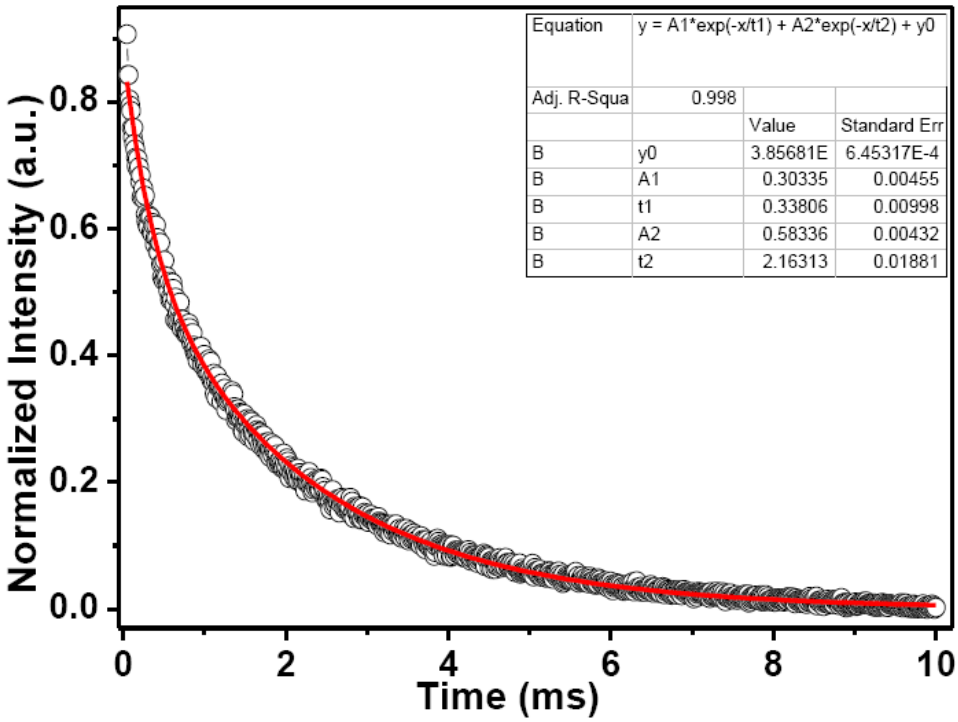

Fig. S4 Photoluminescence decay curve of Eu^{3+} ion in SDS coated 5 mol% Eu^{3+}-doped $CaMoO_4$ nanocrystals dispersed in water.

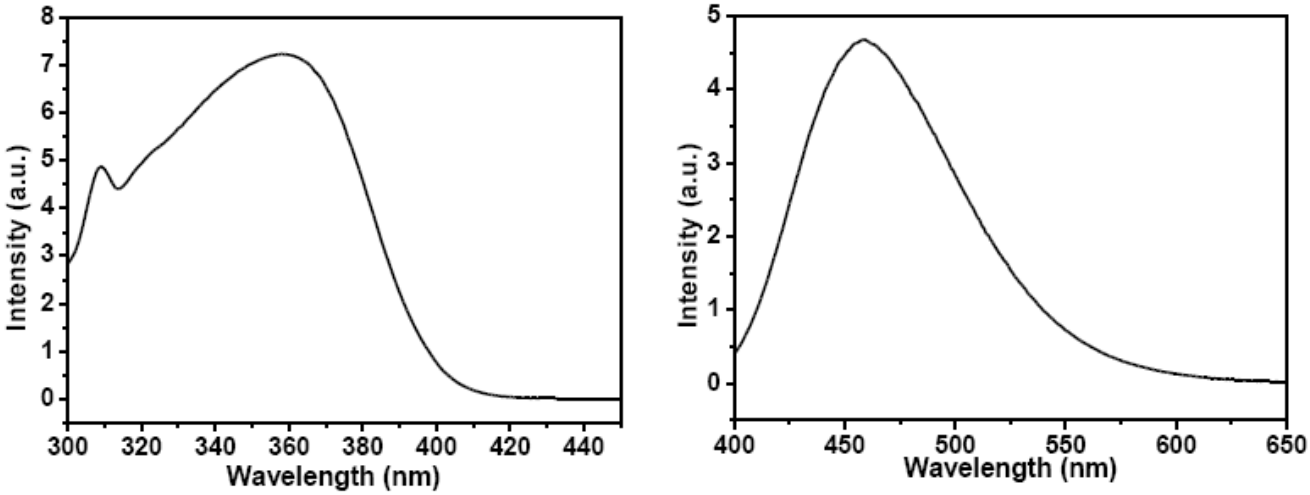

Fig. S5 Absorption (left) and emission (right) spectra of quinine sulphate.

Quantum Yield Calculation

The quantum yield was determined by comparing the luminescence with quinine-sulphate. The quantum yield of Eu^{3+} -doped $CaMoO_4$ nanocrystals was calculated from the following equation-

$Q_{sample} = Q_{ref} (A/A_{ref}) (I_{ref}/I) (n^2/n^2_{ref})$ where, Q_{sample} and Q_{ref} are the quantum yields of the nanocrystals and quinine-sulphate respectively, A is the absorbance, I is the integrated area of photoluminescence spectra, and n is the refractive index of the solution. The quantum yield of Quinine sulphate as the reference is 0.546. The quantum yield of molybdate nanocrystals was estimated by comparing the integrated emission spectra of the aqueous solution with that of Quinine sulphate solution. The sample and the reference have the identical optical density at the excitation wavelength. The calculated quantum yield was about 40 % for Eu^{3+} -doped $CaMoO_4$ nanocrystals.

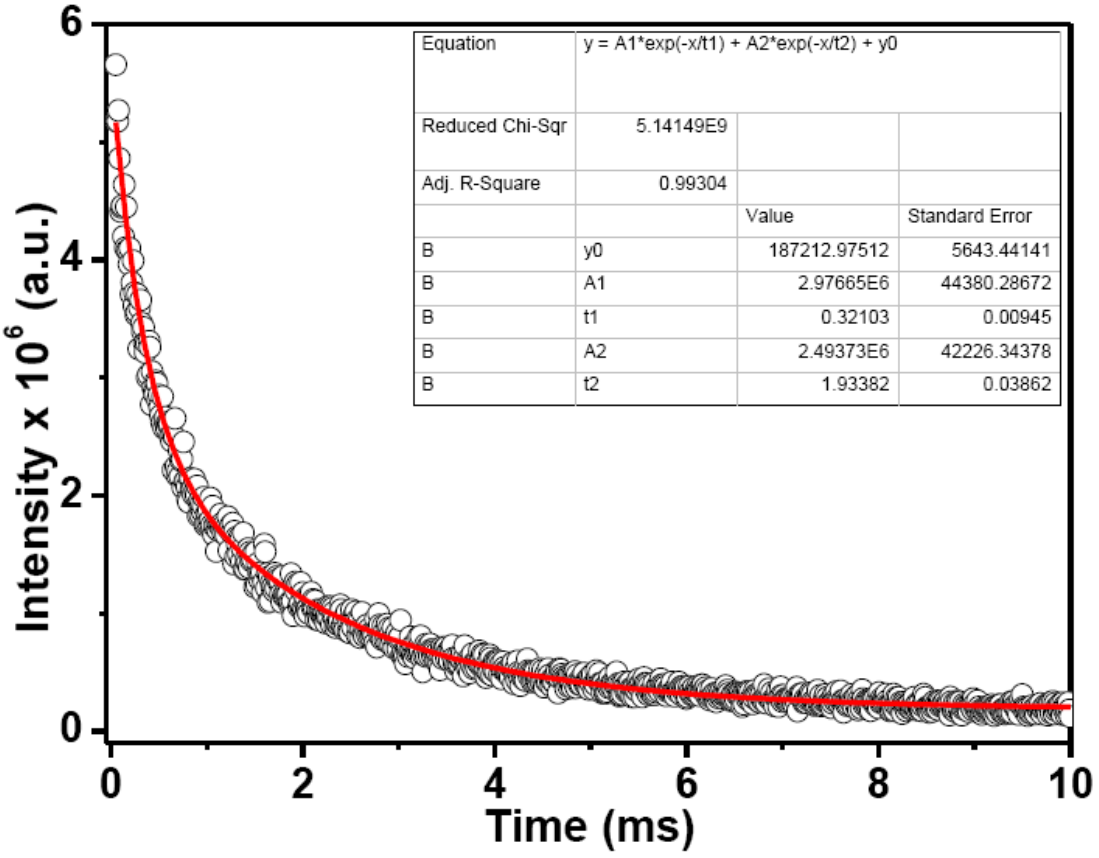

Fig. S6 Photoluminescence decay curve of 5 mol% Eu^{3+}-doped $CaMoO_4$ nanocrystals (without SDS coating) in water.

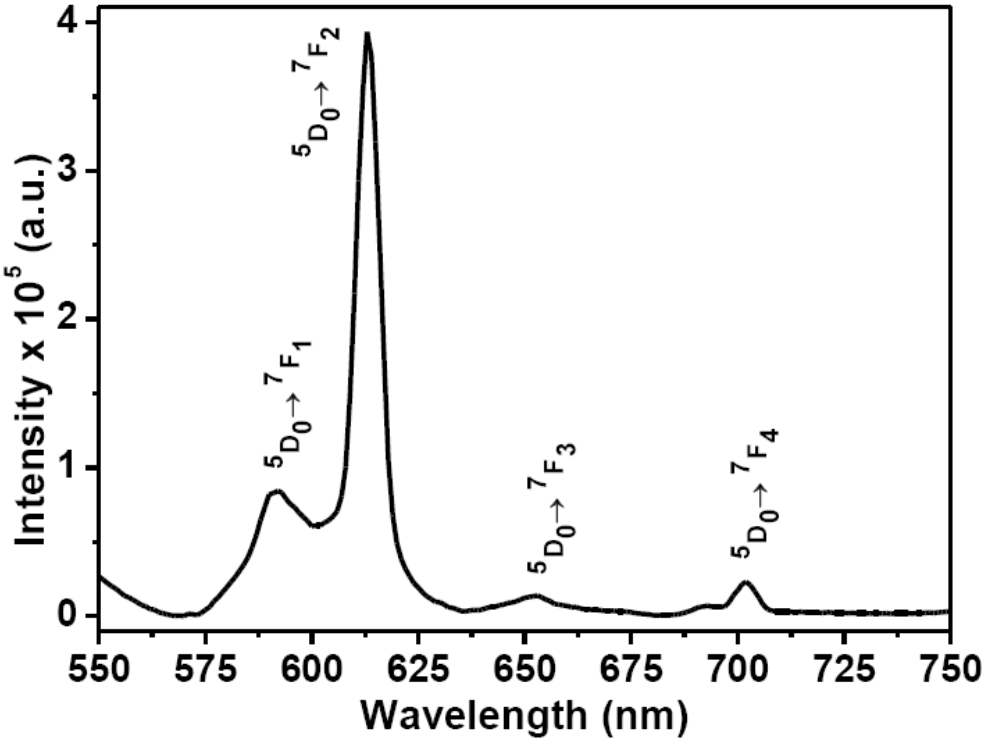

Fig. S7 Emission spectrum of SDS coated Eu^{3+}-doped $CaMoO_4$ nanocrystals transfer to the toluene phase.

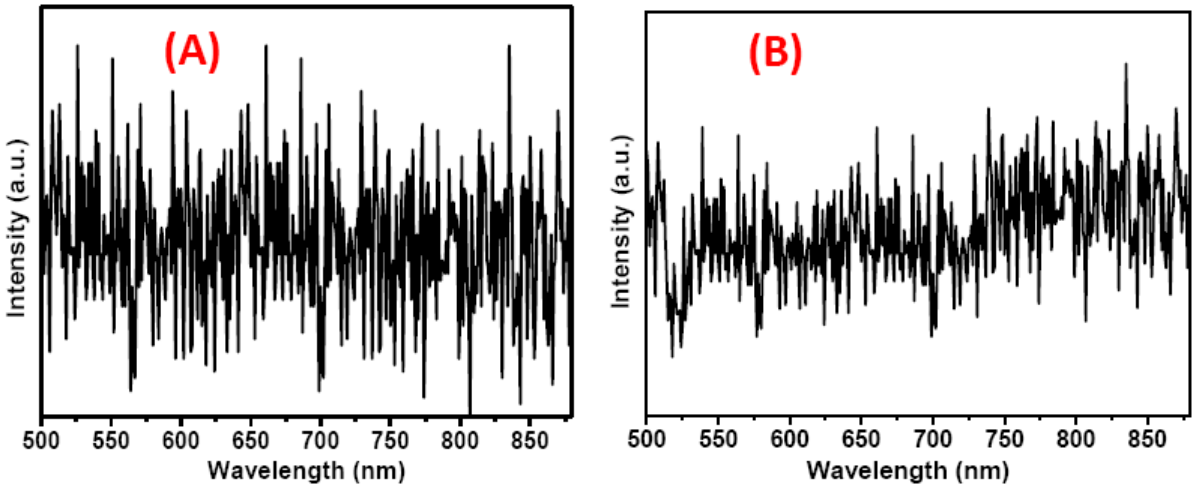

Fig. S8 Upconversion emission spectra of SDS coated (A) Er^{3+}-doped and (B) Yb^{3+}-doped $CaMoO_4$ nanocrystals in toluene measured by exciting the sample with a 980 nm diode laser with 400 mW laser power.

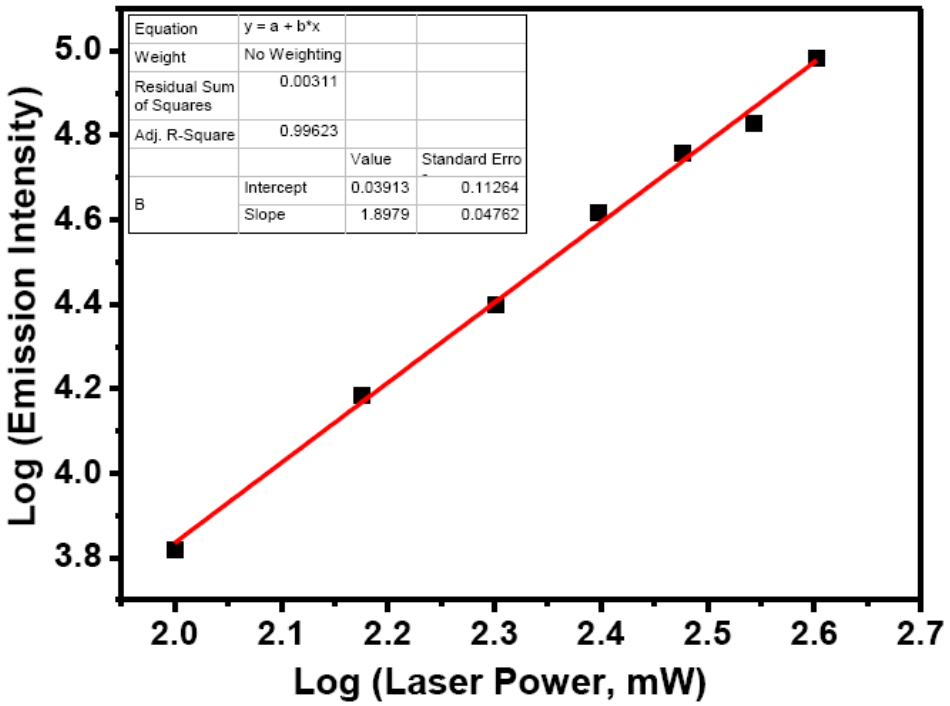

Fig. S9 Power dependent graph of the red upconversion luminescence (650 nm) of SDS coated Er^{3+} / Yb^{3+} -doped $CaMoO_4$ nanocrystals excited at 980 nm.

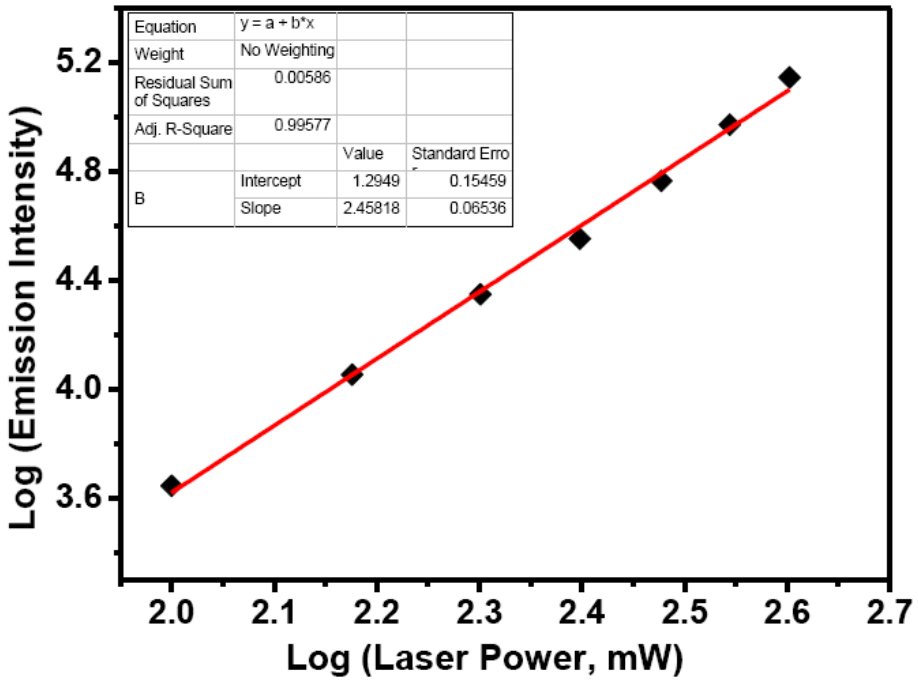

Fig. S10 Power dependence of the NIR upconversion luminescence (833 nm)of SDS coated Er^{3+} / Yb^{3+} -doped $CaMoO_4$ nanocrystals excited at 980 nm.

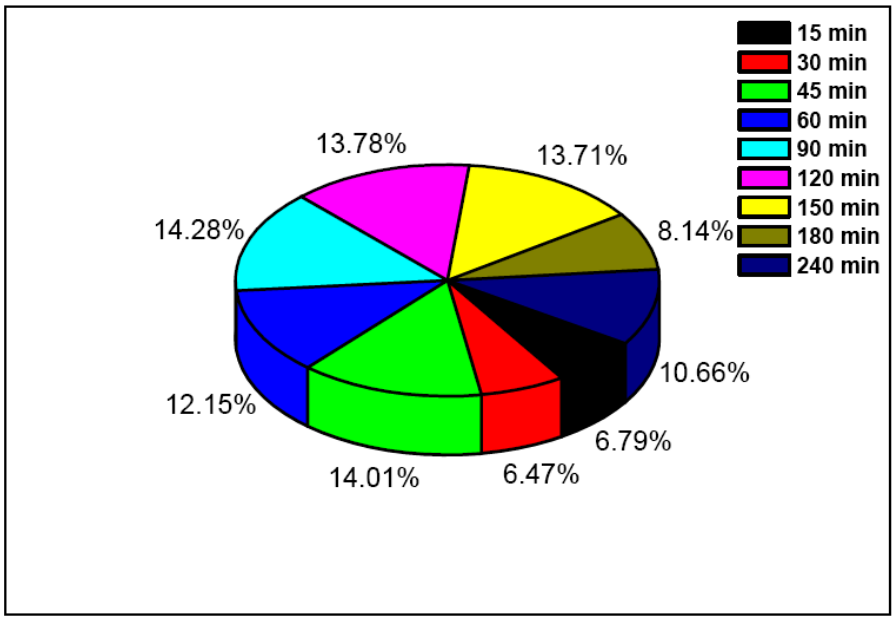

Fig. S11 Pie chart diagram of RhB dye degradation over the surface of Eu^{3+}-doped $CaMoO_4$ nanocrystals.

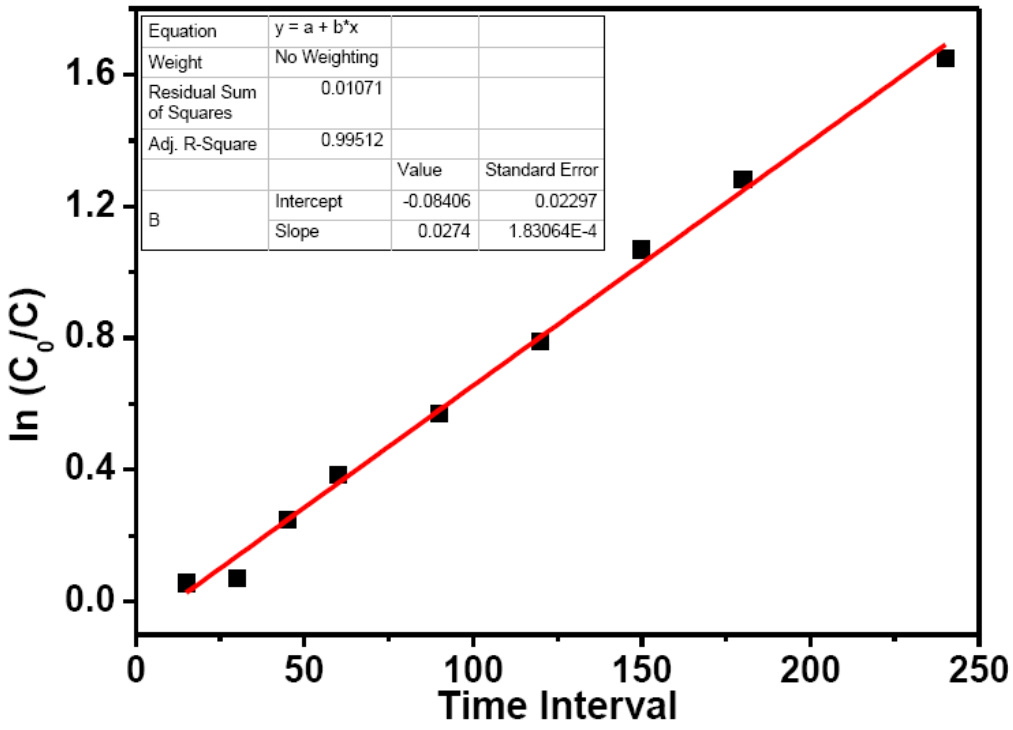

Fig. S12 Plot of ln (C_0/C) verses time showing the first order kinetics of RhB dye degradation over the surface of Eu^{3+}-doped $CaMoO_4$ nanocrystals.