Supporting Information

Controlled synthesis of $CaTiO_3:Ln^{3+}$ nanocrystals for luminescence and photocatalytic hydrogen production

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Table S1. Effect of the $Ca(CH_3COO)_2$ and$Ti(OC_4H_9)_4$contents and reaction solvent on the compositions of samples. (a, b) direct dried in air at 180 °Cfor 24 h and sintered at 600 °C for 2 h. (c, d, e, f, g) after hydrothermal treatment at 180 °C for 24 h, dried in air at 80 °Cfor 4 h, and sintered at 600 °C for 2 h.

Samples	$Ca(CH_3COO)_2$	$Ti(OC_4H_9)_4$	Reaction solvent (30ml)	Treatment	Production
(a)	1.321 g	1.7 ml	ethylene glycol	Sol-gol	$CaTiO_3$+ $CaCO_3$
(b)	1,175 g	1.7 ml	ethylene glycol	Sol-gol	$CaTiO_3$+ $CaCO_3$
(c)	0.882 g	1.7 ml	ethylene glycol	hydrothermal	$CaTiO_3$+ $CaCO_3$
(d)	1.763 g	3.4 ml	ethylene glycol	hydrothermal	$CaTiO_3$+ $CaCO_3$
(e)	0.882 g	1.7 ml	ethanol	hydrothermal	$CaTiO_3$+ $CaCO_3$
(f)	1.763 g	3.4 ml	ethanol	hydrothermal	$CaTiO_3$+ $CaCO_3$
(g)	0.882 g	1.7 ml	methanol	hydrothermal	$CaTiO_3$+ $CaCO_3$

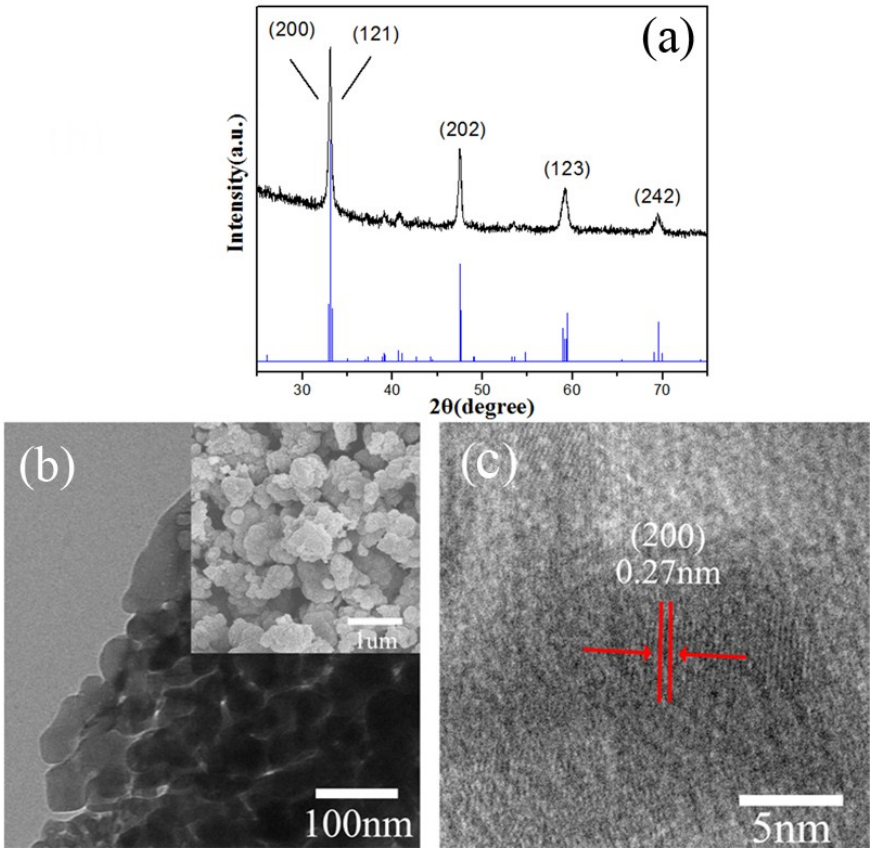

Figure S1. XRD patterns, SEM, TEM and HRTEM images of$CaTiO_3$nanocrystals.

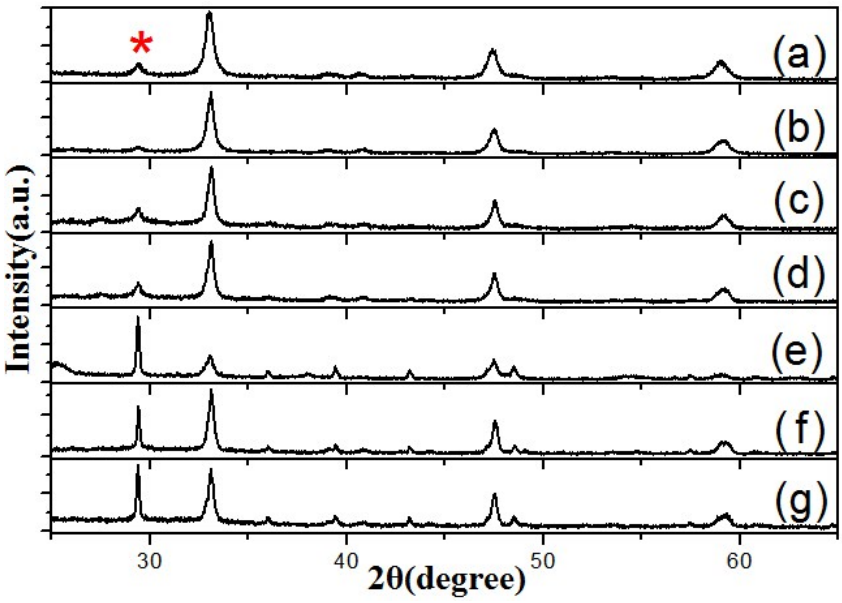

Figure S2. XRD patterns of samples prepared at different conditions (corresponding to the sample (a-g) of Table S1) .The peaks marked by asterisk (∗) arise from calcite $CaCO_3$ particles (JCPDS 05-0586).

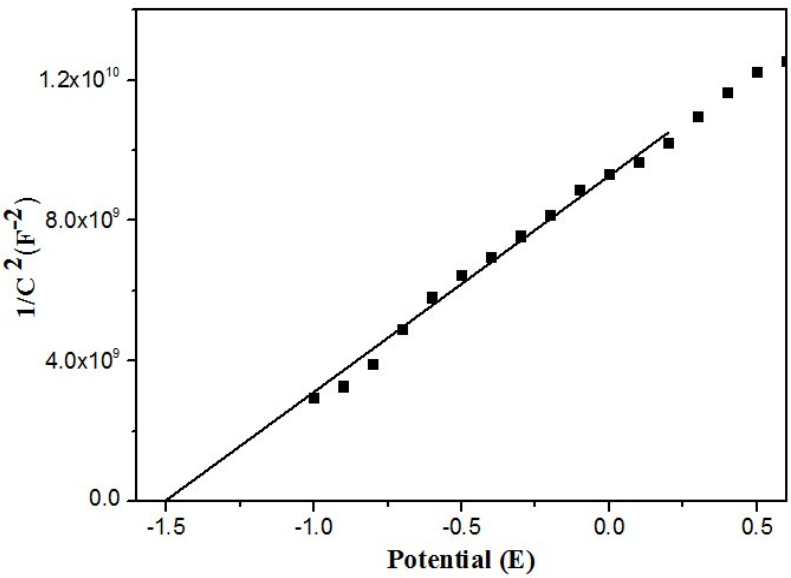

Figure S3. Mott–Schottky plots of $CaTiO_3$nanocrystals.

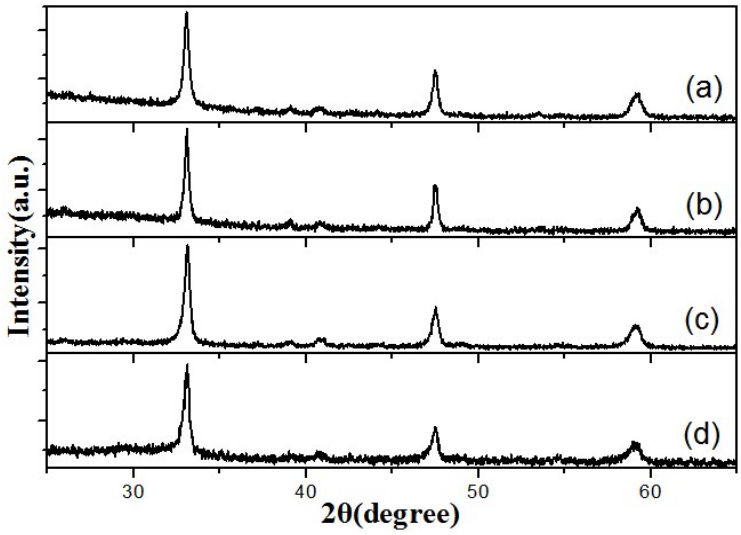

Figure S4. The XRD patterns of (a)$CaTiO_3$:Eu^{3+}(0.5%), (b) $CaTiO_3$:Eu^{3+}(5%), (c)$CaTiO_3$:Eu^{3+}(15%) and (d)$CaTiO_3$:Eu^{3+}(20%) nanocrystals.

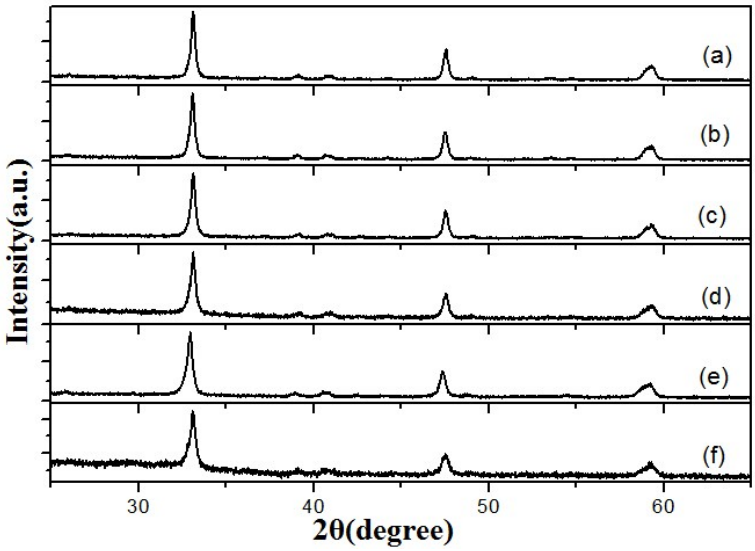

Figure S5. The XRD patterns of (a)$CaTiO_3$:Er^{3+}(0.5%), (b) $CaTiO_3$:Er^{3+} (3%), (c) $CaTiO_3$:Er^{3+}(5%), (d) $CaTiO_3$:Er^{3+}(10%), (e) $CaTiO_3$:Er^{3+}(15%) and (f) $CaTiO_3$:Er^{3+}(20%) nanocrystals.

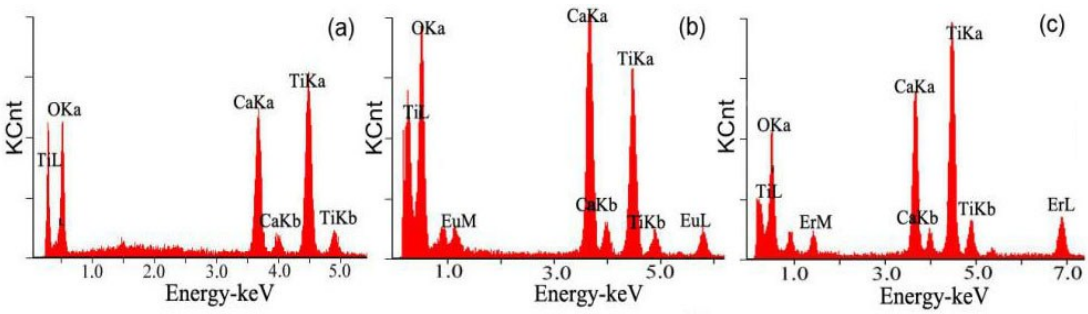

Figure S6. The EDX analysis results of (a) pure $CaTiO_3$, (b) $CaTiO_3$:Eu^{3+}(10%), (c) $CaTiO_3$:Er^{3+}(10%) nanocrystals.

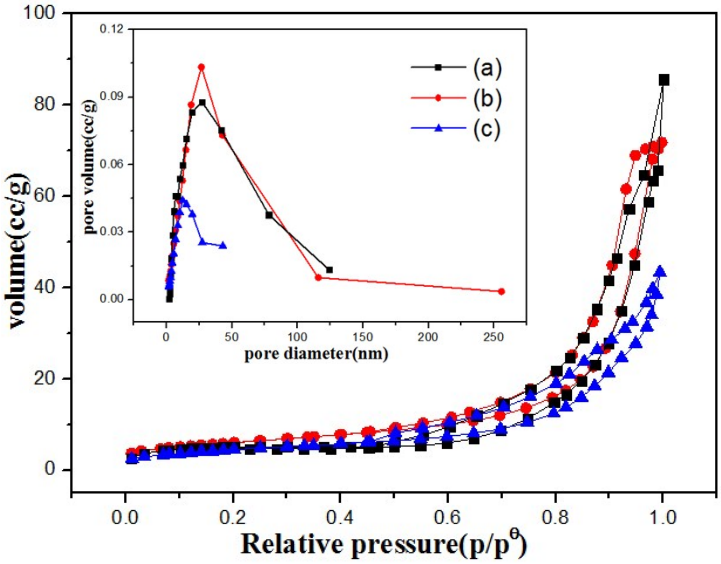

Figure S7. N_2 adsorption–desorption isotherm curves and pore size distribution (inset) of (a) $CaTiO_3$nanocrystals, (b) $CaTiO_3$:Er^{3+}(0.5%), (c) $CaTiO_3$:Eu^{3+}(0.5%)nanocrystals.