

Supporting Information

Microwave-assisted synthesis and up-down conversion luminescent
properties of multicolor hydrophilic $\text{LaF}_3: \text{Ln}^{3+}$ nanocrystals

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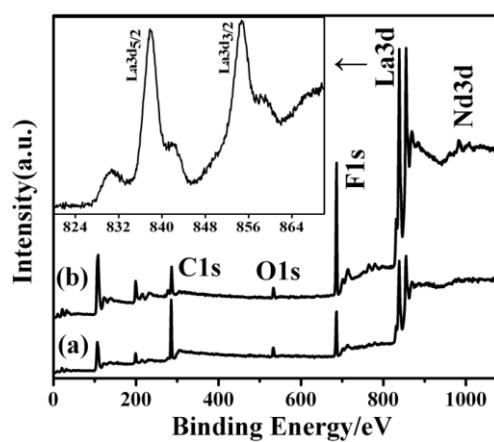


Figure S1. X-ray photoelectron spectra of $\text{LaF}_3\text{:Nd}^{3+}$ nanocrystals. Insert: La 3d core level.

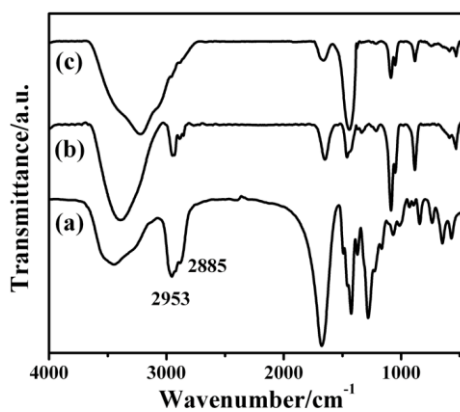


Figure S2. FT-IR spectra of (a) pure PVP; (b) the PVP-coated $\text{LaF}_3\text{:Ln}^{3+}$ nanocrystals; (c) pure $\text{LaF}_3\text{:Ln}^{3+}$ nanocrystals.

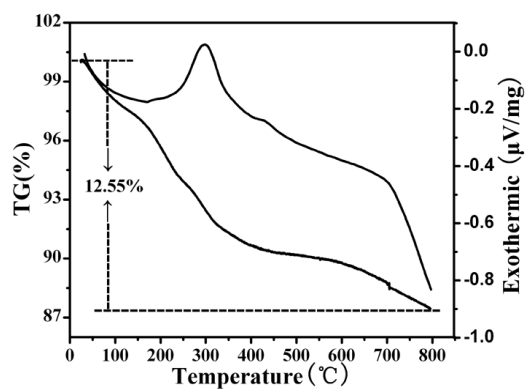


Figure S3. TG-DTA curve of $\text{LaF}_3\text{:Ln}^{3+}$ nanocrystals.

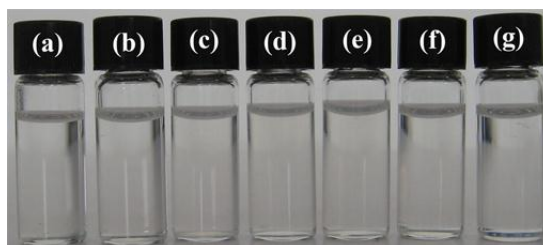


Figure S4. Photographs of colloidal solutions of the PVP/ $\text{LaF}_3\text{:Ln}^{3+}$ nanocrystals dispersed in different solvents. (a) water; (b) methanol; (c) ethanol; (d) EG; (e) chloroform; (f) DMF; (g) DMSO.

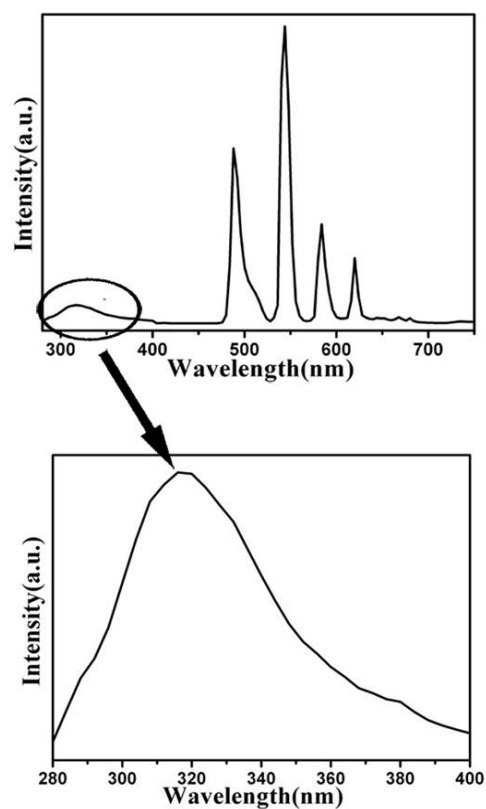


Figure S5. Emission spectra of LaF₃:Ce³⁺, Tb³⁺ nanocrystals, ranging from 280 nm to 750 nm.

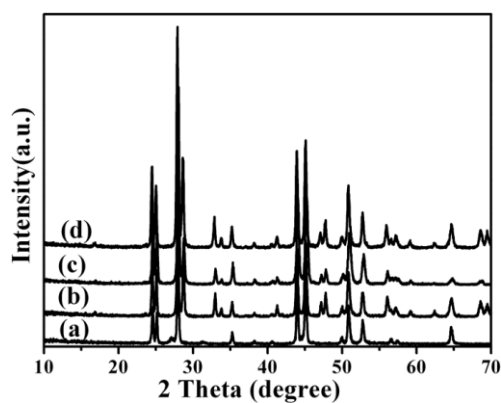


Figure S6. The XRD pattern of as-synthesized UC LaF₃:Ln³⁺ nanocrystals after annealing at 600°C;

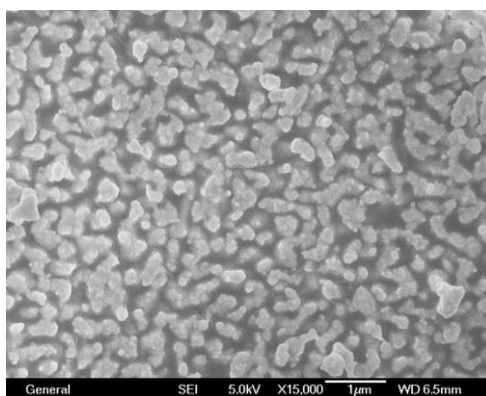


Figure S7. FE-SEM images of UC $\text{LaF}_3\text{:Ln}^{3+}$ nanocrystals annealed at 600°C .

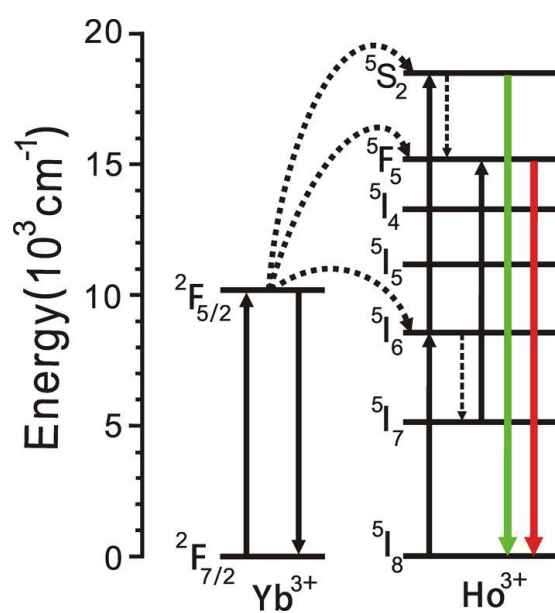


Figure S8. Energy-transfer mechanisms showing the upconversion process in Ho^{3+} , Yb^{3+} doped nanocrystals under 980nm laser diode excitation.