

Core-mediated synthesis, growth mechanism and near-infrared luminescence enhancement of α -NaGdF₄@ β -NaLuF₄:Nd³⁺ core-shell nanocrystals

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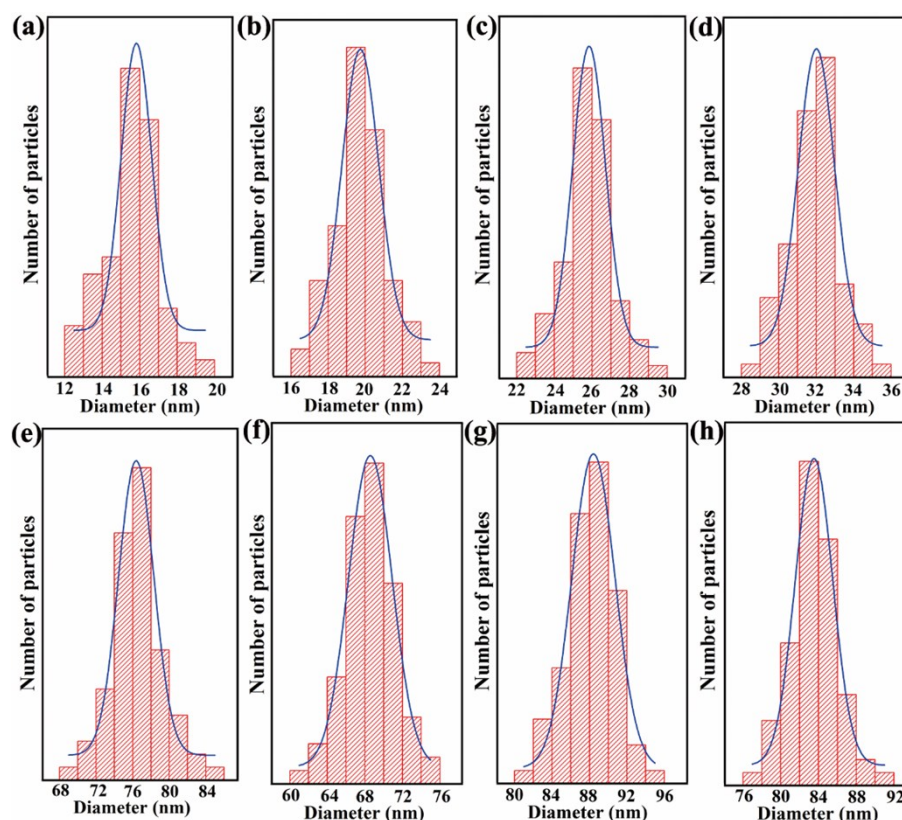


Fig. S1 Histograms of size distribution of (a) α -NaGdF₄ core nanocrystals; (b)–(d) α -NaGdF₄@ β -NaLuF₄:Nd³⁺ core-shell nanocrystals with the shell growth time of 2 h, 4 h, 8 h, respectively; (e)–(f) the length and diameter of 12 h-reaction α -NaGdF₄@ β -NaLuF₄:Nd³⁺ core-shell nanocrystals; (g)–(h) the length and diameter of 18 h-reaction α -NaGdF₄@ β -NaLuF₄:Nd³⁺ core-shell

nanocrystals.

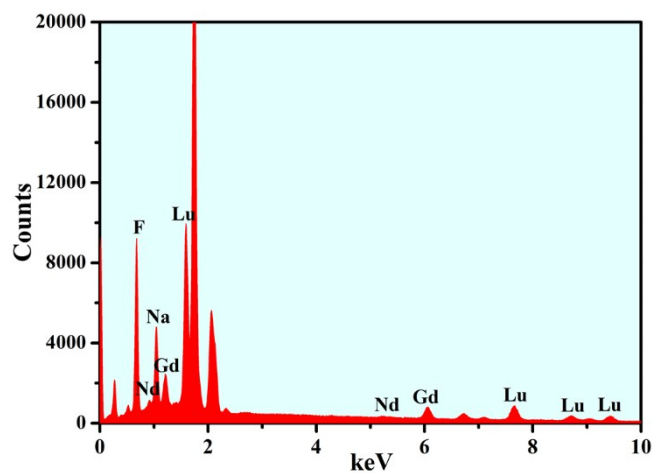


Fig. S2 EDX analysis of elemental composition of α -NaGdF₄@ β -NaLuF₄:Nd³⁺ core-shell nanocrystals.

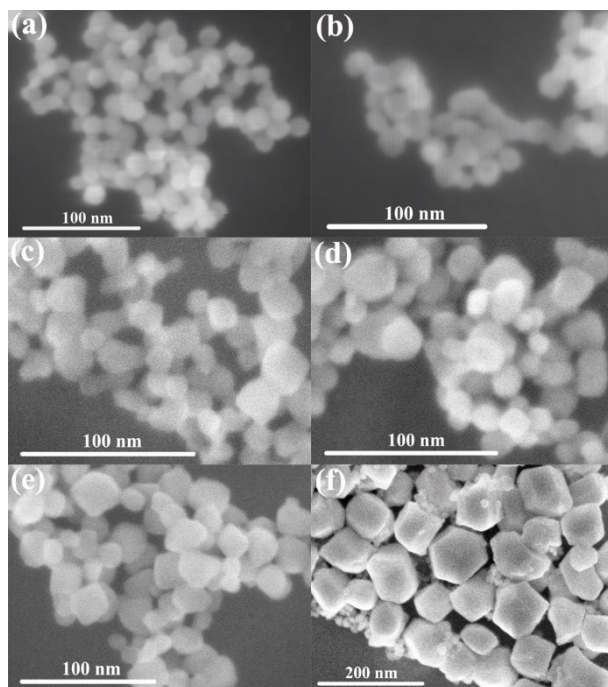


Fig. S3 SEM images of (a) α -NaGdF₄ core nanocrystals, (b)–(f) α -NaGdF₄@ β -NaYF₄:Nd³⁺ core-shell nanocrystals with different shell growth time: (b) 2 h; (c) 4 h; (d) 8 h; (e) 12 h; (f) 18 h.

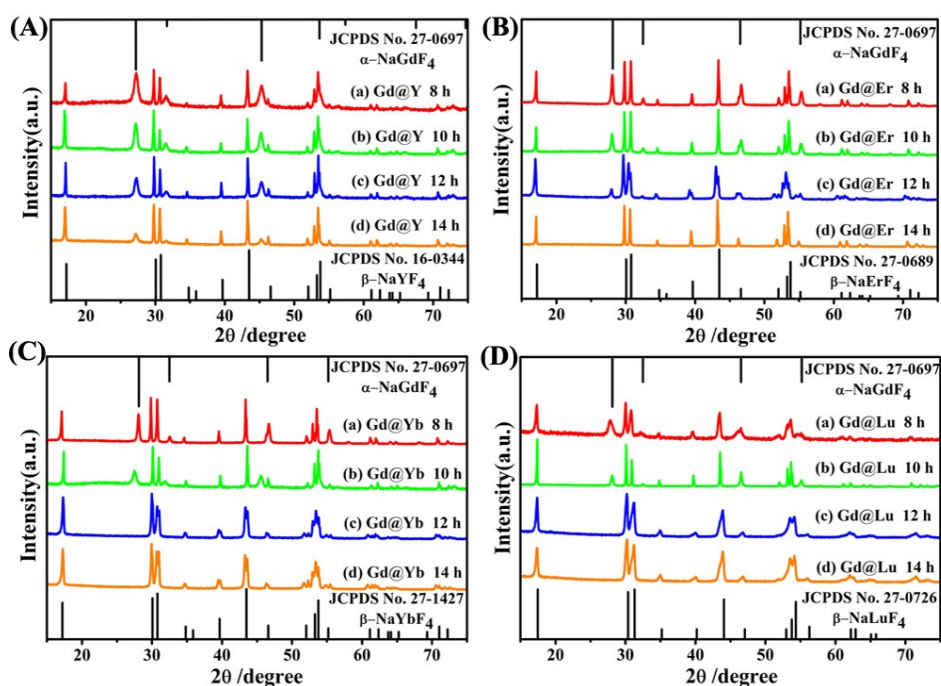


Fig. S4 XRD patterns of (A) α-NaGdF₄@β-NaYF₄:Nd³⁺ core-shell nanocrystals, (B) α-NaGdF₄@β-NaErF₄:Nd³⁺ core-shell nanocrystals, (C) α-NaGdF₄@β-NaYbF₄:Nd³⁺ core-shell nanocrystals, (D) α-NaGdF₄@β-NaLuF₄:Nd³⁺ core-shell nanocrystals, which have different shell growth time of (a) 8 h; (b) 10 h; (c) 12 h; (d) 14 h.

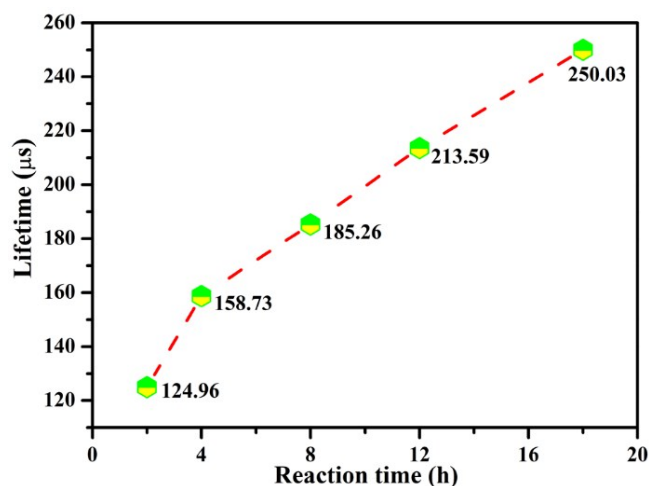


Fig. S5 The lifetime of Nd³⁺:⁴F_{2/3} in the α-NaGdF₄@β-NaLuF₄:Nd³⁺ core-shell nanocrystals as a function of shell reaction time.