Electronic Supplementary Material (ESI) for CrystEngComm.

Supplementary Information:

Low Temperature Surfactant-free Synthesis of Monodispersed β-$NaGdF_4$ Nanorods by Novel Ion-exchange Process and Their Luminescent Properties

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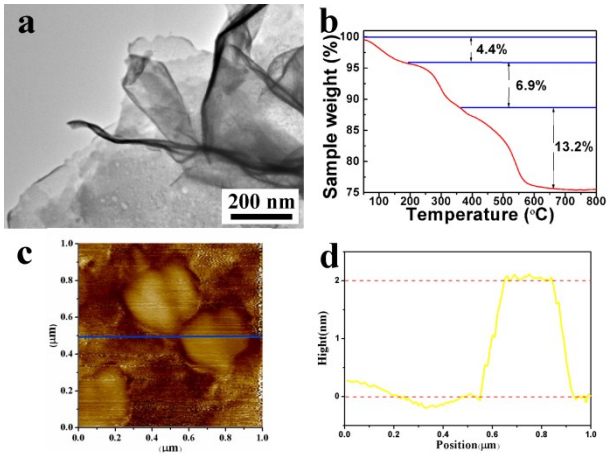

Fig. S1 SEM image (a), TGA trace (b), AFM image (c), AFM height profile (d) of the as-prepared precursor.

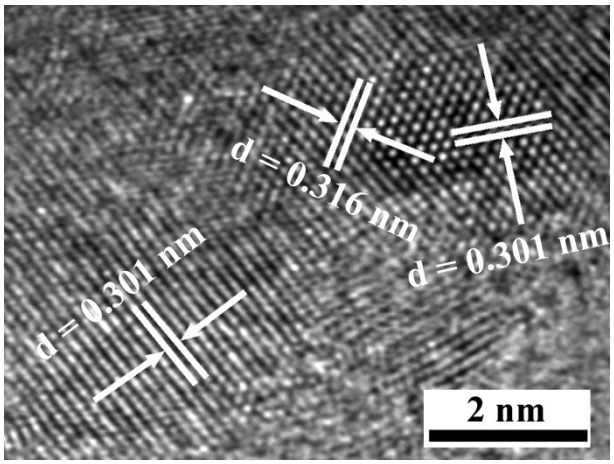

Fig. S2 HRTEM image of the nanosheets formed after dropping in NaF solution for 10 minutes.

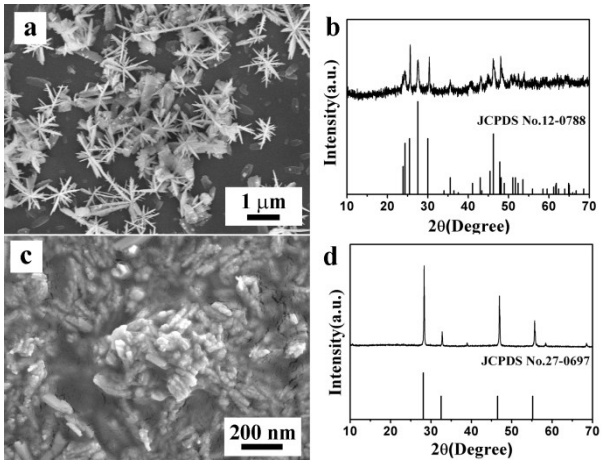

Fig. S3 SEM image (a), XRD patterns (b) of as-prepared GdF_3; SEM image (c), XRD patterns (d) of as-prepared cubic $NaGdF_4$.

As shown in Fig. S3, without the introducing of ammonium hydroxide solution and the structural directing of the Gadolinium hydroxynitrate precursor, the product resulted from hydrothermal reaction of aqueous solution containing $Gd(NO_3)_3$ and NaF depends on the flouride to Gadolinium molar ratio. A ratio of 4/1 leads to the formation of GdF_3 (Fig. S3a, b) and a ratio of 12/1 results in the formation of cubic $NaGdF_4$ (Fig. S3c, d). When other parameters were the same, different flouride to Gadolinium ratios would produce GdF_3 or cubic $NaGdF_4$ or a mixture of these, but no pure hexagonal $NaGdF_4$ had been detected.

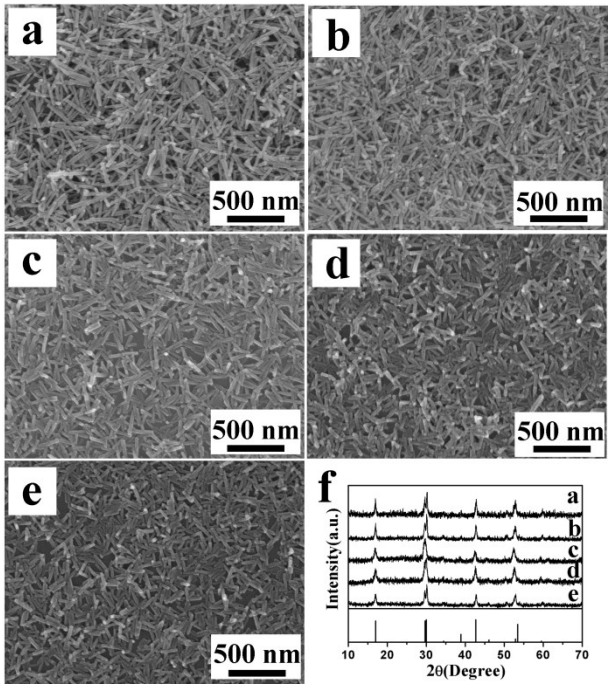

Fig. S4 SEM images of doped $NaGdF_4$ nanoparticles: $NaGdF_4:Eu^{3+}$ (a), $NaGdF_4:Tb^{3+}$ (b), $NaGdF_4:Yb^{3+},Er^{3+}$ (c), $NaGdF_4:Yb^{3+},Tm^{3+}$ (d), $NaGdF_4:Yb^{3+},Ho^{3+}$ (e); corresponding XRD patterns of a, b, c, d, and e (f).

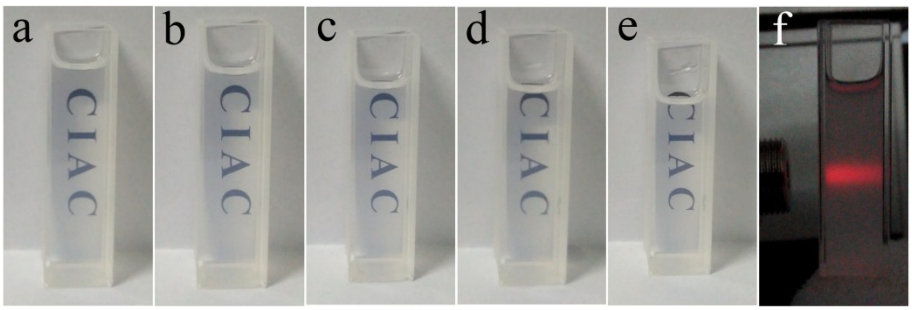

Fig. S5 Digital photographs of one typically fabricated β-$NaGdF_4$ nanocrystal being dispersed in water (2 mg/mL) for different times: a, 8 hours; b, 16 hours; c, 1 day; d, 2 days and e 3 days. UC luminescence digital photograph of one typically synthesized $NaGdF_4$:Yb,Er nanocrystal being dispersed in water, all the other parameters are the same as the one in ethanol.