Electronic Supplementary Material (ESI) for CrystEngComm

Supporting Information

Facile Synthesis and Properties of Spherical Assemblies of $NaYF_4$ Nanocrystals with Consistent Cystalline Orientation

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S1. The intermediate sample collected at the beginning of the synthesis (see Fig.4A) were also characterized with XRD analysis and shown in Fig. S1A. XRD pattern of the sample suggests that the products are pure $NaYF_4$ crystals, although the reaction time is short and the sizes of these nanocrystals are much small. No obvious peaks from impurities or reactants were detected, suggesting that the followed morphological changes of samples were surely based on self-assemble and Ostwald ripening process, rather than induced by reactants or others. To conform this, the products collected at 90 ºC for 10 min were also measured (Fig. S1B). The result indicates that these samples are also pure $NaYF_4$ crystals and the crystallization of products is gradually improved as the reaction time prolongs.

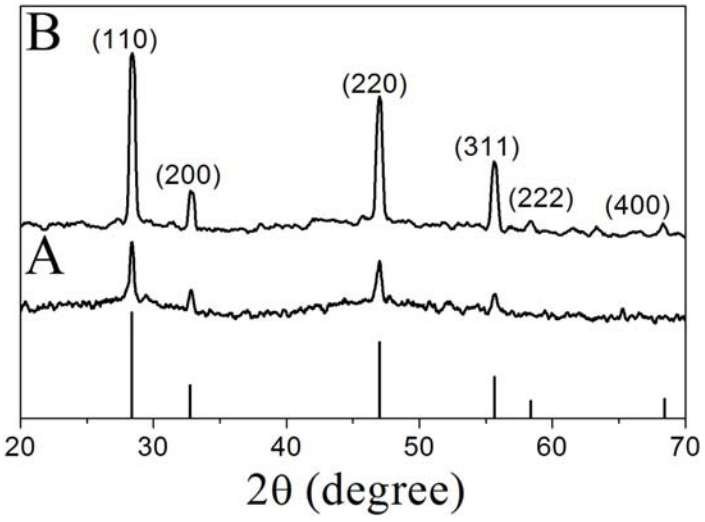

Fig. S1. XRD patterns of the intermediate samples collected during the synthesis of $NaYF_4$ assemblies. Samples were collected (A) once the solutions were mixed at room-temperature; (B) after heated to 90 ºC and maintained for 10 min.

S2. Upconversion spectra of $NaYF_4$:Yb,Er assemblies dispersed in physiological saline (0.9% NaCl) and phosphate buffered saline (1×PBS) were also measured over one week, respectively. Using the fluorescence intensity of the red emission (655 nm) as Y-coordinate and the dispersed time as X-coordinate, the profile the fluorescence stability of the assemblies was plotted and shown in Fig. S2. The results indicate that the upconversion fluorescence of these assemblies are much stable in these biological mediums.

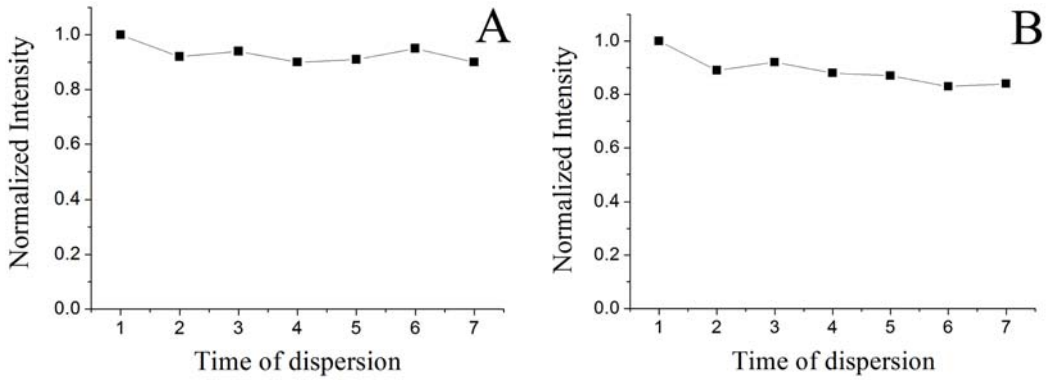

Fig. S2. Fluorescence stability of $NaYF_4$: 20%Yb, 2%Er assemblies dispersed in different mediums over one week. (A) physiological saline (0.9% NaCl); (B) phosphate buffered saline (1×PBS).

S3. Experimental details for coating a thin layer of silica on $NaYF_4$ assemblies.

Silica-coating process was carried out by modifying the well-known Stöber method. In a typical process, 1 mL of aqueous nanocrystals solution (0.05 M) was added into a mixed solution of 28 mL of ethanol, 4 mL of DI water and 1 mL of ammonia (28wt.%). Then another 2 mL of ethanol solution containing 60 μL TEOS was slowly added into this solution in about 1 h under magnetically stirring. Subsequently, the mixed solution was continually stirred for another 4 h. Final products were collected by centrifugation, washed with ethanol and water twice, respectively, and dispersed in DI water to form a transparent dispersion.