Supplementary Material (ESI) for CrystEngComm

Electronic Supplementary Information (ESI)

Controllable Synthesis and Formation Mechanism of Luminescent Monodispersed $NaEuF_4$ Submicron Disks through Assembled Nanocrystals

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Experimental section

Typically, a desired amount (0, 0.1, 1.0, 2.0, 3.0, and 5.0 g) of citric acid (99.5%) and 0.336 g of sodium fluoride (98.0%) were dissolved in 22 mL of distilled water to obtain a transparent solution. The pH value of the solution was adjusted by adding NH_4OH (25%) and the solution was heated up to 80 °C. Then, 20 mL of aqueous solution containing 2.0 mmol of $Eu(NO_3)_3$ was added to the above solution under stirring and the mixture was kept at the temperature of 80 °C for different time (5 min, 10 min, 90 min, 2 h, and 3.5 h). The obtained suspension was cooled down to room temperature, and the solid was separated by centrifugation, washed with ethanol, and finally dried at 70 °C for 12 h.

Phase structure of the obtained samples was characterized by a Bruker D8 Advance X-ray diffractometer with Cu Kα radiation (λ = 0.15406 nm). Morphology was observed using field emission scanning electron microscope (JEOL-JSM 6335F) and transmission electron microscope (JEOL 2010). Fourier transform infrared infrared (FTIR) spectrum was recorded for KBr disks containing powder sample with a MAGNA-IR760 Spectrometer E. S. P. (Nicolet). Photoluminescence spectra and lifetime were recorded using an FLS920P Edinburgh Analytical Instrument apparatus equipped with a 450W xenon lamp and a μF900H high-energy micro-second flashlamp as excitation sources. Low-voltage cathodoluminescence spectrum was obtained using a RELIOTRON III CL instrument. Spectra data were collected using an Ocean Optics USB4000 charge coupled device spectrometer. All the measurements were performed at room temperature.

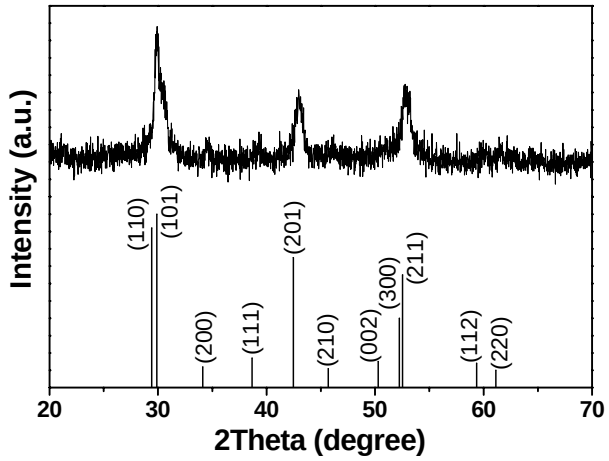

Fig. S1. X-ray diffraction (XRD) patterns of $NaEuF_4$ submicron disks and standard data for corresponding bulk materials (JCPDS Card No. 49-1897).

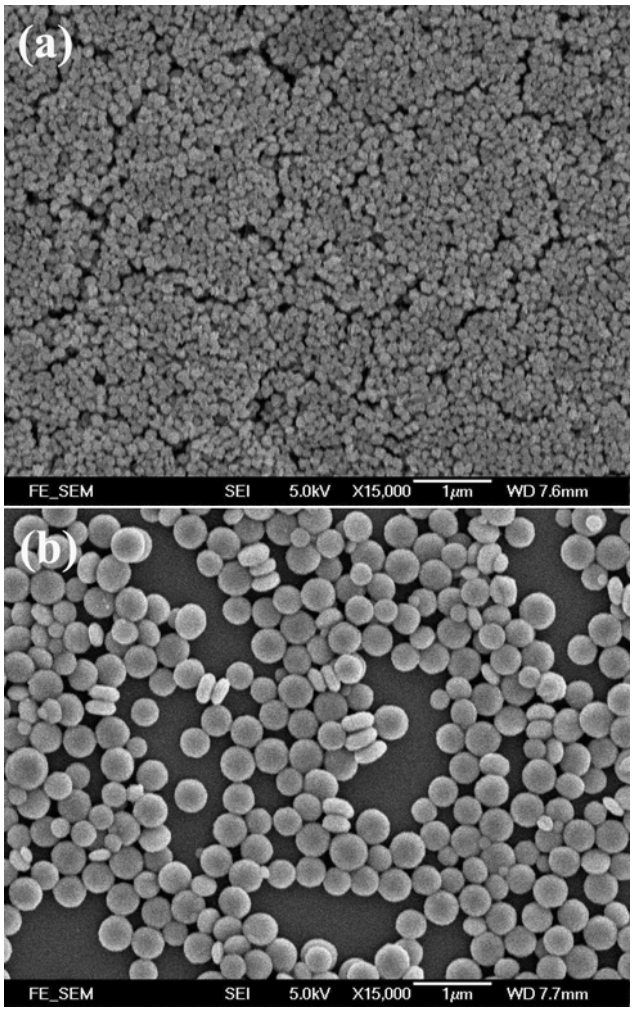

Fig. S2. SEM images of samples with different pH values: (a) pH = ~2, and (b) pH = 8.

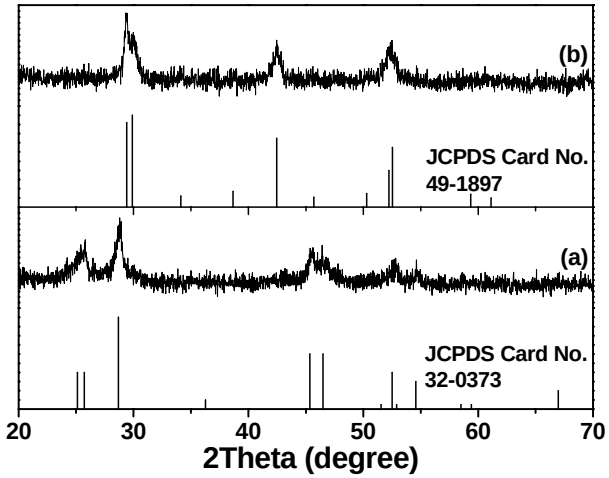

Fig. S3. XRD patterns of samples with different pH values and standard data of corresponding bulk powders: (a) pH = ～2, EuF_3, JCPDS Card No. 32-0373, and (b) pH = 8, $NaEuF_4$, JCPDS Card No. 49-1897.

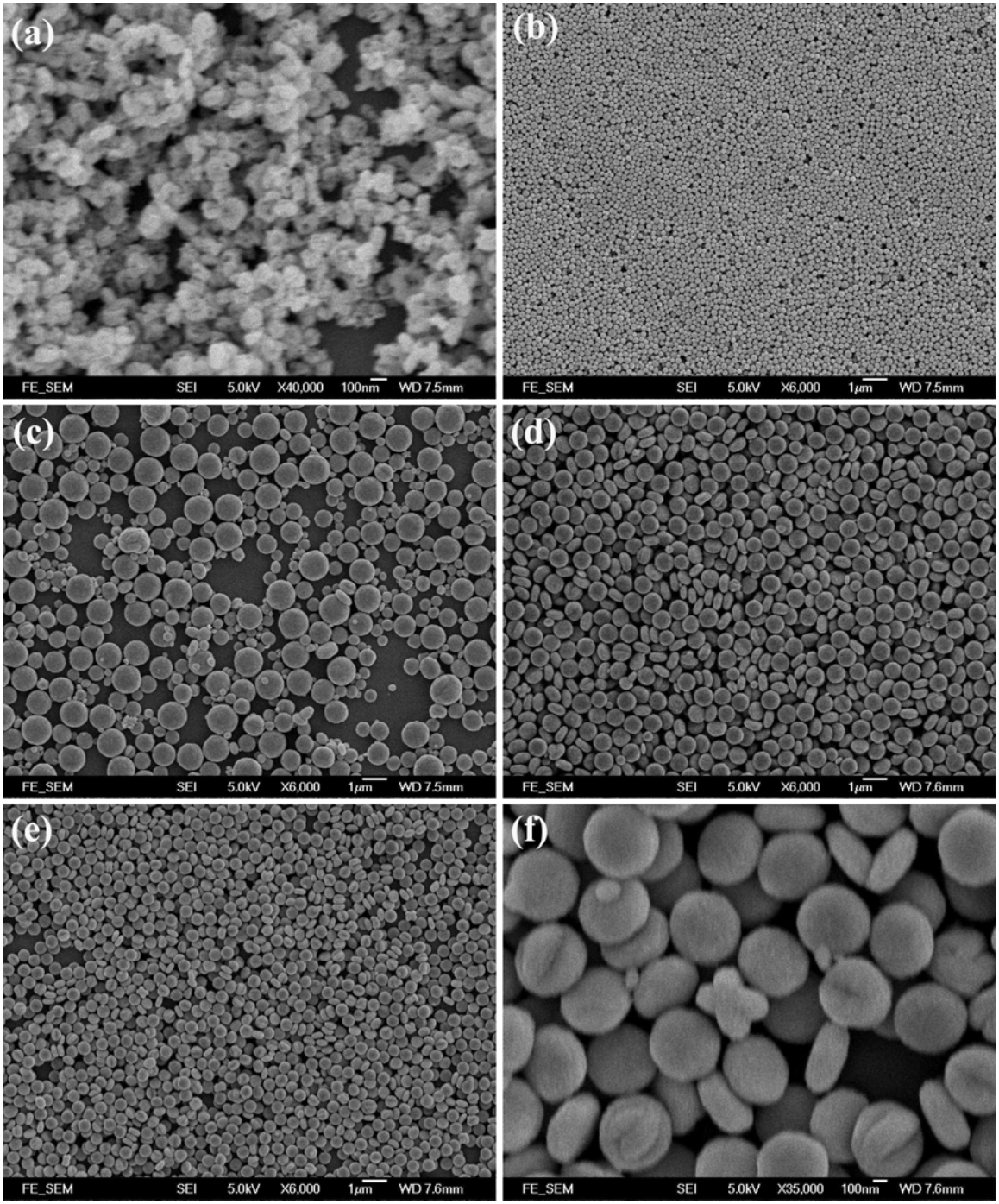

Fig. S4. SEM images of samples with different amount of citric acid: (a) 0 g, (b) 0.1 g, (c) 1.0 g, (d) 2.0 g, and (e, f) 5.0 g.

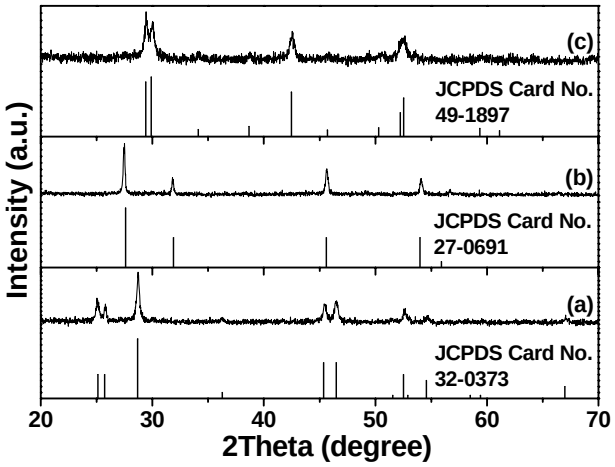

Fig. S5. XRD patterns of samples with different amount of citric acid and standard data of corresponding bulk particles: (a) citric acid = 0 g, EuF_3, JCPDS Card No. 32-0373, (b) citric acid = 0.1 g, $Na_5Eu_9F_{32}$, JCPDS Card No. 27-0691, and (c) citric acid = 1.0 g, $NaEuF_4$, JCPDS Card No. 49-1897.

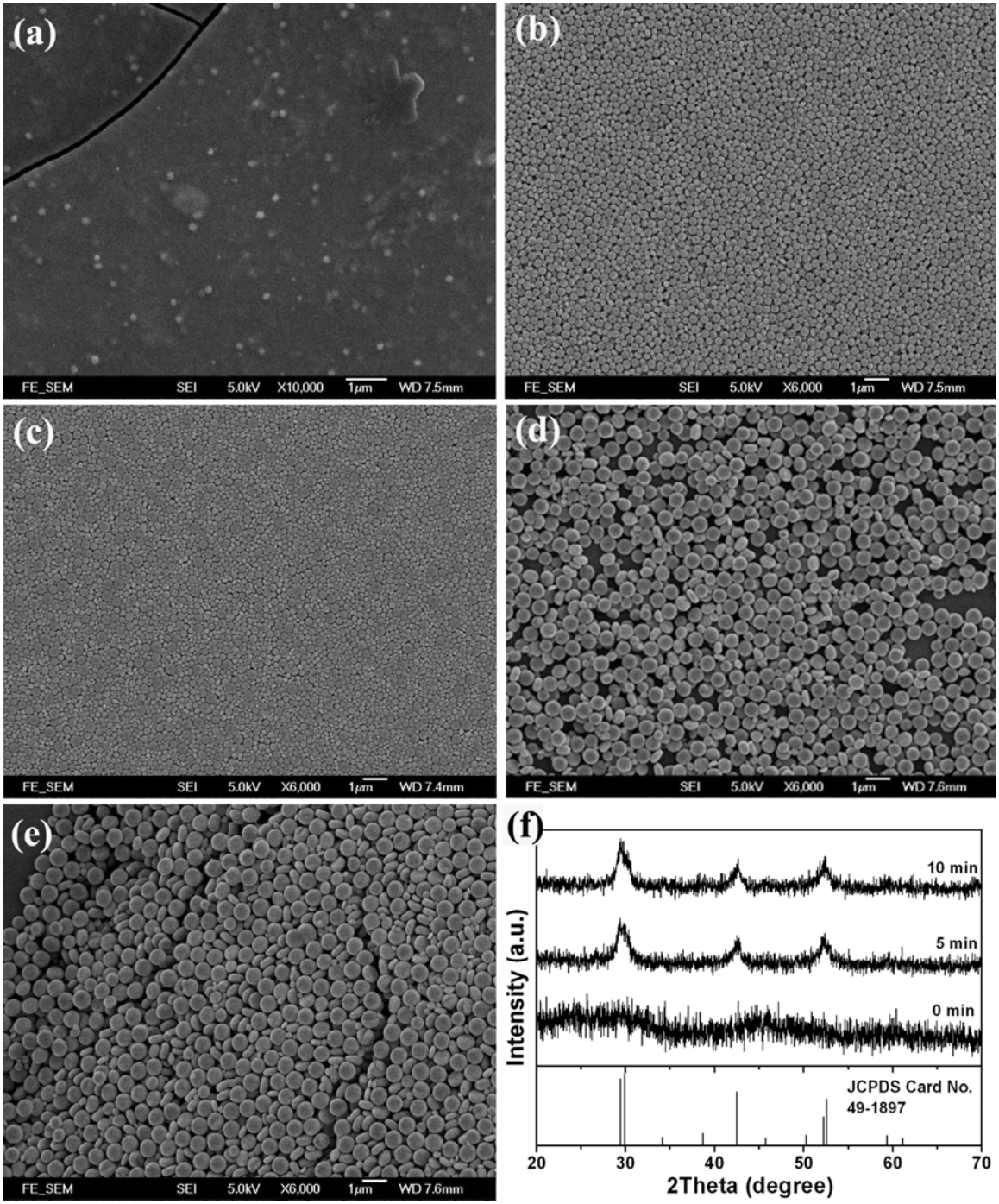

Fig. S6. SEM images and XRD patterns of samples with different reaction time: (a) 0 min, (b) 5 min, (c) 10 min, (d) 2 h, (e) 3.5 h, and (f) XRD patterns.

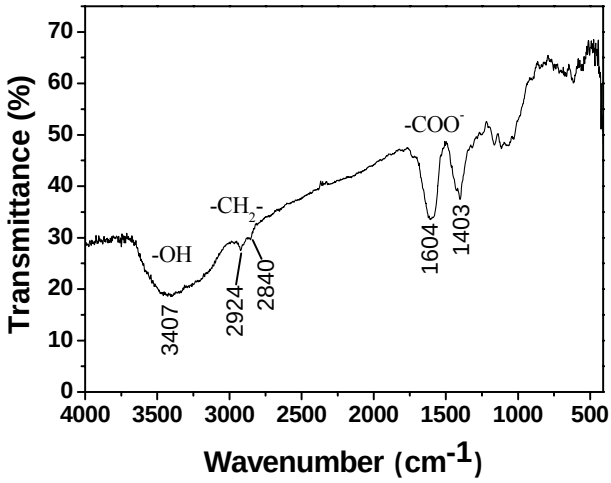

Fig. S7. FT-IR spectrum of $NaEuF_4$ submicron disks.