Supporting Information

Gadolinium Oxide Nanoring and Nanoplate: Anisotropic Shape Control

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Experimental Section

Synthesis of Gd_2O_3 nanoplates: A slurry of $Gd(acac)_3$ (1 mmol), PA/HA (1.2 mmol/1.2 mmol), hydrazine monohydrate (4 mmol), and TOA (5 mL) prepared in a 100 mL Schlenk tube was heated at 90 °C with a vigorous magnetic stirring for 24 h. Subsequent thermal treatment at 320 °C for 1h and separation by precipitation/centrifugation provided a tan powder, which can be easily re-dispersed in various organic solvents.

Synthesis of Er_2O_3 and Yb_2O_3 nanostructures: $Er(acac)_3$ and $Yb(acac)_3$ were similarly treated as for $Gd(acac)_3$ with appropriate surfactant concetrations. After treatment at 90 ^oC, the hydrolyzed reaction mixtures were further treated at 270 ^oC and 320 ^oC for Er and Yb systems, respectively.

Characterization: The prepared Gd_2O_3, Er_2O_3, and Yb_2O_3 nanorings and naoplates were characterized by XRD (Rigaku D/MAX-RC (12 kW) diffractometer using graphite-monochromatized Cu-Kα radiation at 40 kV and 45 mA), TEM (low resolution: Omega EM912 operated at 120 kV; high resolution: JEM3010 operated at 300 kV), and selected area electron diffraction (SAED) patterns attached to EM912. Samples for TEM investigations were prepared by putting an aliquot of dichloromethane solution of nanorings and nanoplates onto an amorphous carbon substrate supported on a copper grid. The excess liquid was then wicked away with tissue, and the grid was allowed to dry at room temperature.

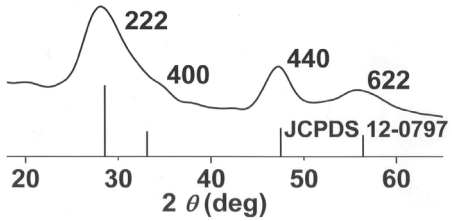

Figure S1. XRD pattern of Gd_2O_3 nanoplates

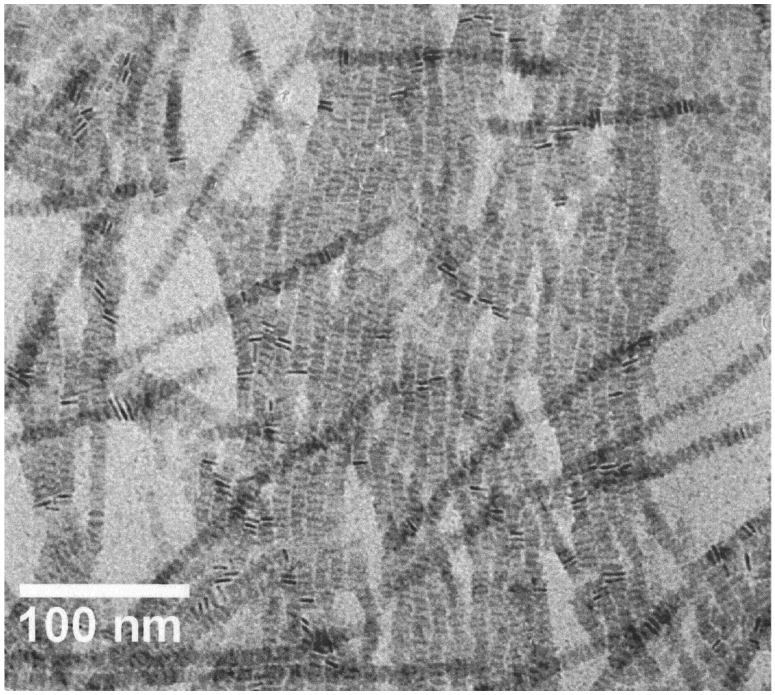

Figure S2. Large area TEM image of Gd_2O_3 nanoplates

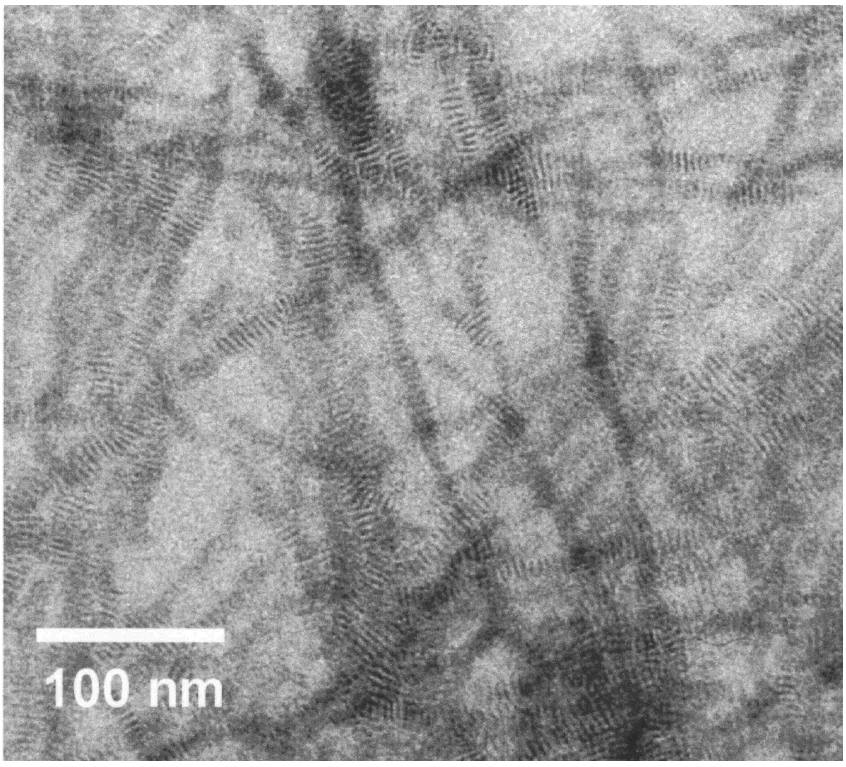

Figure S3. Large area TEM image of hydrolyzed precursor-surfactant (before Gd_2O_3 plate formation).

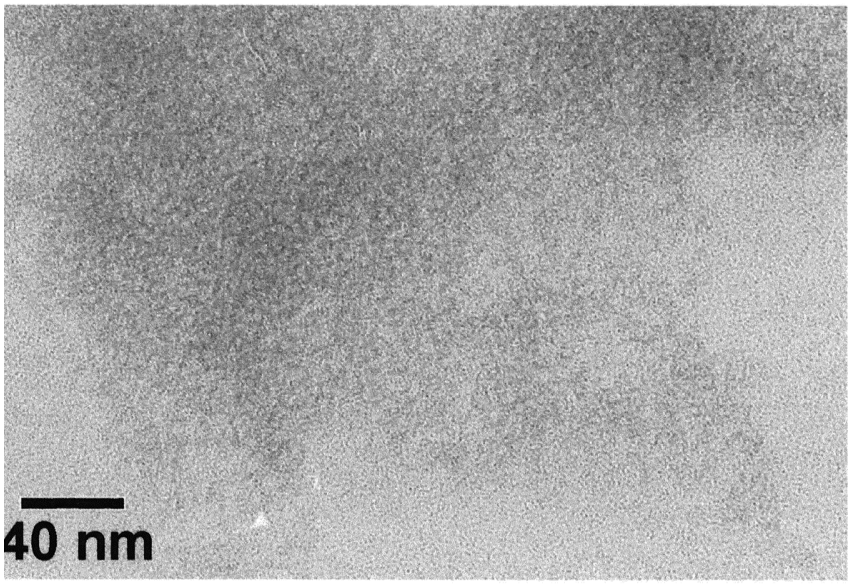

Figure S4. Large area TEM image of hydrolyzed precursor-surfactant (before Gd_2O_3 ring formation).

Note the weak contrast due to poor crystal quality of hydroxides.

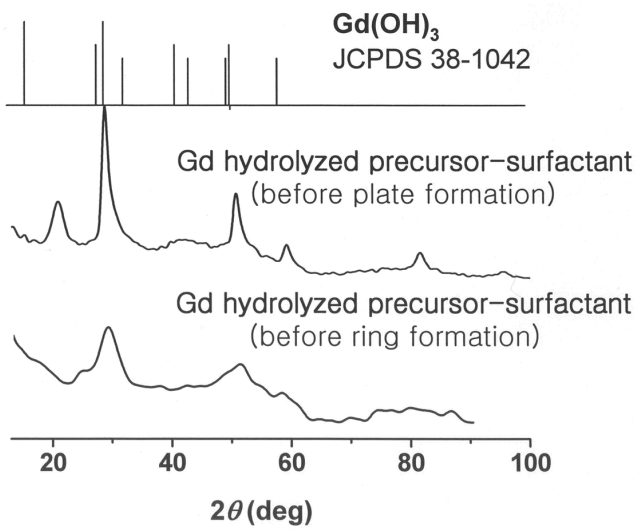

Figure S5. XRD patterns of hydrolyzed precursor-surfactant.

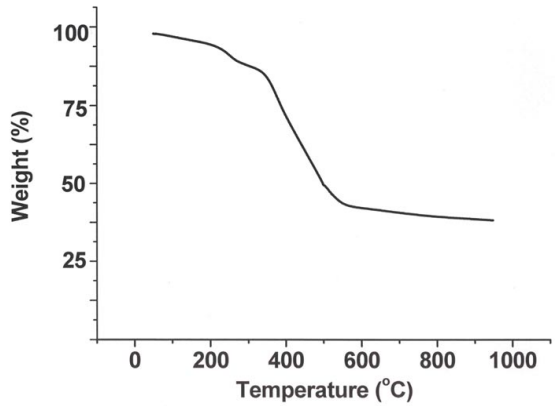

Figure S6. TGA graph of hydrolyzed precursor-surfactant.

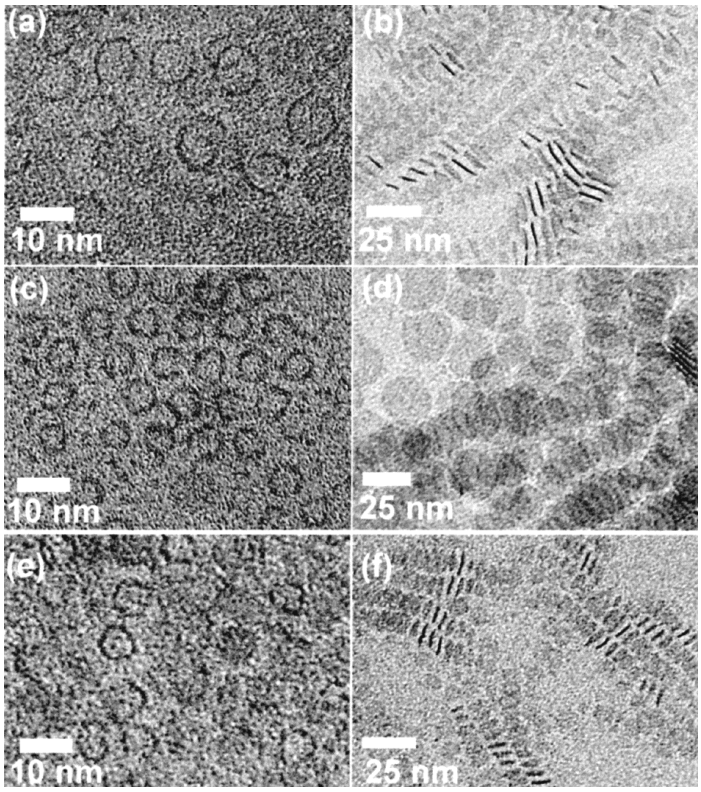

Figure S7. Nanorings and nanoplates of Gd_2O_3 (a and b), Yb_2O_3 (c and d), and Er_2O_3 (e and f). a) Gd/NDA/ODA = 1/0.5/0.5 equiv, b) Gd/NDA/ODA = 1/1.2/1.2 equiv, c) Yb/HA/PA = 1/1.2/1.2 equiv, d) Yb/HA/PA = 1/2/2 equiv, e) Er/HA/PA = 1/0.5/0.5 equiv, f) Er/HA/PA = 1/1/1 equiv.

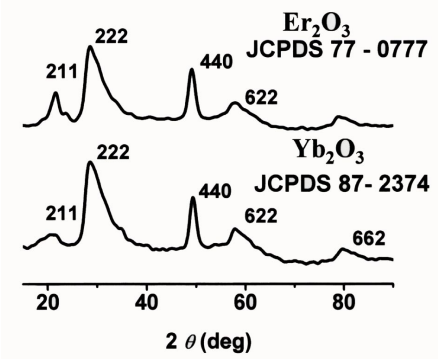

Figure S8. XRD patterns for *c*-Er_2O_3 and *c*-Yb_2O_3 nanoplates.