

Supporting Information for

Selectively Assembled 2D Microarrays from Binary Nanocrystals

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Synthesis of CeO₂ nanocrystals

Of 16.7 mmol/L cerium (III) nitrate aqueous solution, 15 mL was added into a 50-mL autoclave, and then a 15-mL mixed solution of toluene, oleic acid (OLA), and tert-butylamine (0.15 mL) was added with a molar ratio of Ce : OLA = 1:8 to the autoclave in open air without stirring. The sealed autoclave was heated at 180 °C for 36 h, then cooled down to room temperature. The morphology of the nanocrystals can be controlled by the reaction temperature.

Fabrication of colloidal dispersion of nanocrystal

After the synthesis, the upper organic crude solution was centrifuged to separate the CeO₂ nanocrystals. The centrifuged CeO₂ nanocrystals were redispersed into 10-mL toluene, then oleic acid was added. The concentration of oleic acid was adjusted at 4 vol%. The colloid dispersion of CeO₂ nanocrystals was aged for 2 months at room temperature. The aggregates of nanocrystals were obtained by centrifugation.

Characteristic of the 2D millimetric microarrays

Structures of the microarrays were characterized by transmission electron microscopy (TEM), high-resolution TEM (HRTEM), fast Fourier transform (FFT) profiles, and Fourier transform IR (FT-IR). The orientation of their assemblies was identified via the selected area electron diffraction (SAED) pattern.

A copper grid covered with a collodion film was placed on a piece of filter paper. One drop of the suspension of CeO₂ nanocrystals was placed on the grid perpendicularly. The excess suspension of CeO₂ nanocrystals was absorbed rapidly by the filter paper and the nanocrystals were deposited on the grid. In the TEM observation, the monolayer of cubic nanocrystals on collodion film was irradiated under electron beam (JEM-2100F, 200 kV) for 15 minutes to observe the fusion between nanocrystals (at the magnification of 1000K times).

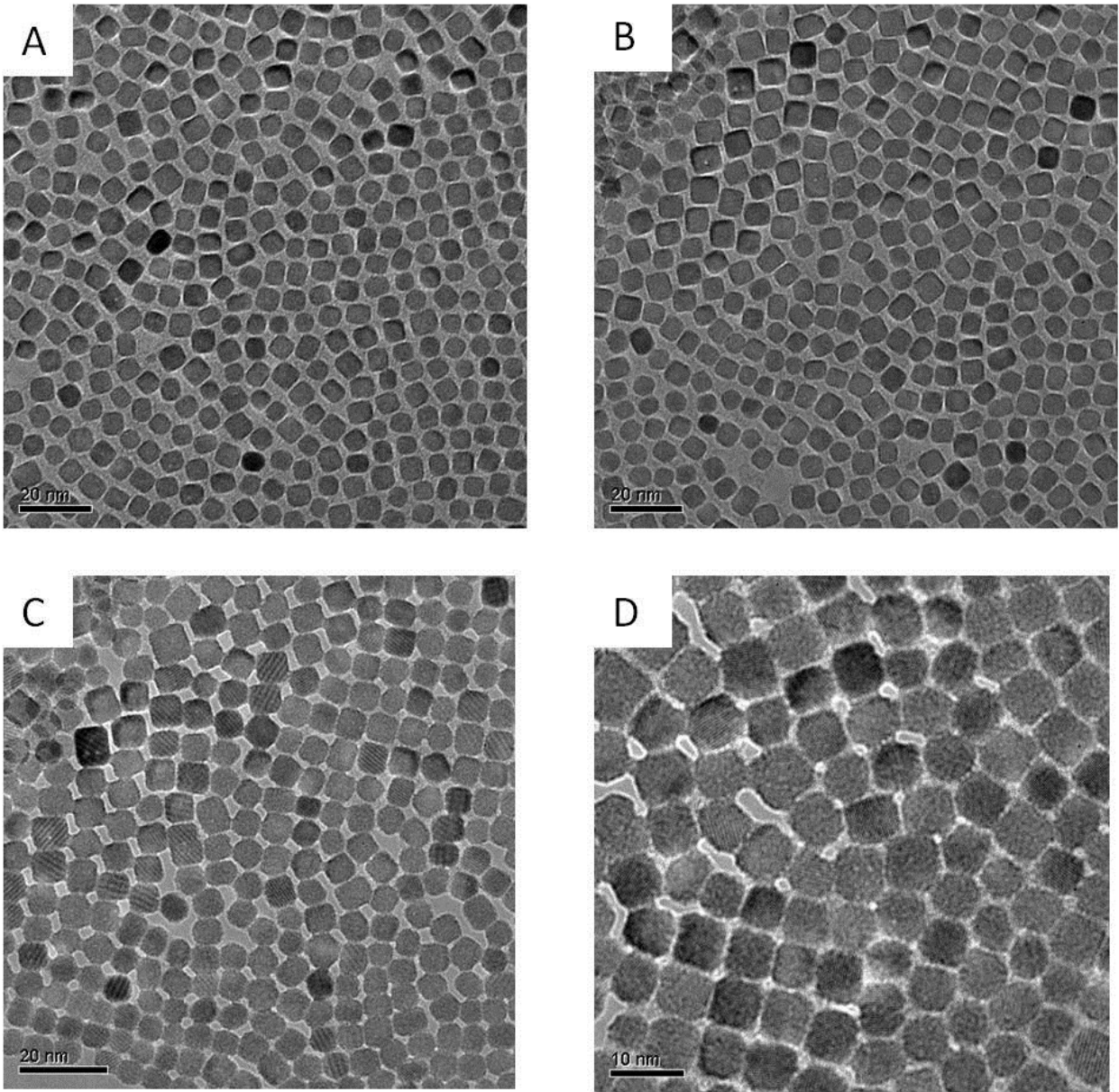


Fig. S1 TEM images of fusion and aggregation of cubic-like nanocrystals under irradiation of an electron beam for (A) 0, (B) 5, (C) 10 and (D) 15 min.

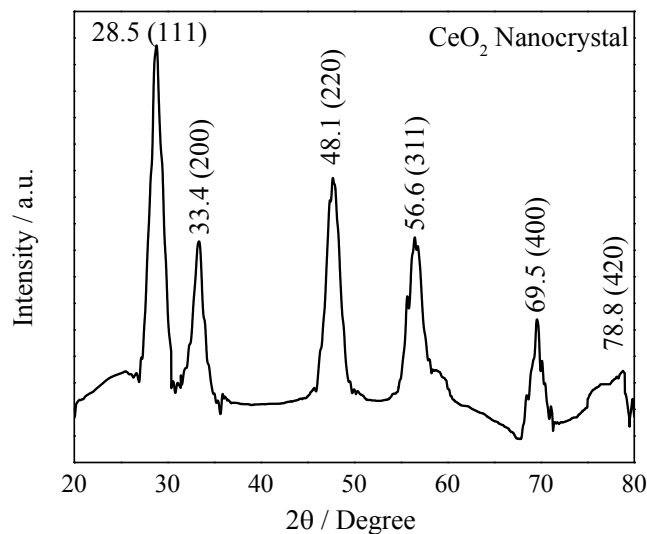


Fig. S2 XRD pattern of CeO₂ nanocrystals. The crystal plane spacings calculated from the FFT of HRTEM images were in good agreement with the PDF data of CeO₂ (PDF# 65-59-23).

As for pure oleic acid, two sharp bands at 2920 and 2850 cm⁻¹ were attributed to the asymmetric and the symmetric CH₂ stretch, respectively. The intense peak at 1710 cm⁻¹ was derived from the existence of the C=O stretch, and the band at 1285 cm⁻¹ exhibited the presence of the C–O stretch. The O–H in-plane and out-of-plane bands appeared at 1462 and 937 cm⁻¹, respectively.¹ It is clear from our results that no obvious difference was observed from the particles dispersed in the oleic acid.

Reference

1. L. Zhang, R. He and H.-C. Gu, *Applied Surface Science*, 2006, 253, 2611-2617.