Supporting information for

Octahedral Fe_3O_4 nanoparticles and their assembled structures

Luhui Zhang,[a] Jiajia Wu,[b] Hanbin Liao,[a] Yanglong Hou,*[a] and Song Gao*[b]

[a] *Department of Advanced Materials and Nanotechnology, College of Engineering, Peking University, Beijing 100871, China;Fax: (+86) 10-82529028 ;E-mail: hou@pku.edu.cn*
[b] *College of Chemistry and Molecular Engineering, Peking University, Beijing 100871, China;Fax: (+86) 10-62751708 ;E-mail: gaosong@pku.edu.cn*

Experimental

The iron oleate complex was prepared following a method similar to that described by Hyeon et al. [1] Oleylamine (OAm) (70 %) was purchased from Aldrich. Tetracosane was obtained from Tianjin Chemical Research Institute. Sodium oleate, $FeCl_3.6H_2O$, hexane and ethanol were purchased from Beijing chemical works. All these chemicals were used without further purification.

Synthesis: Iron oleate (2.32 mmol), tetracosane (10 g) and oleylamine (OAm, 4.64 mmol) were put into a three-neck flask. The mixture was heated to 70 ^{o}C, and kept for 20 min to dissolve tetracosane sufficiently under a nitrogen atmosphere. Subsequently, the solution was degassed under vacuum at 120 ^{o}C for 30 min, and then heated up to 380 ^{o}C with a constant heating rate of 2.5 °C/min under a nitrogen atmosphere, and kept at this temperature for 10 min before cooling down to room temperature. The iron oxide NPs were precipitated upon adding 20 mL ethanol and washed three times with ethanol and hexane. The as-prepared iron oxide NPs were finally dispersed in hexane.

Powder X-Ray Diffraction: Phase formation was verified using a DMAX-2400 diffractometer equipped with a Cu Kα X-ray tube emitting at 1.5418 A°. Colloidal solutions were dropped onto a glass slide for the analysis.

Electron Microscopy: Particle imaging was accomplished using a JEOL JEM-200CX TEM operating at 160 kV. High-resolution TEM (HRTEM) images were performed with a Philips Tecnai F30 FEG-TEM instrument operated at 300 kV. The general morphology of the products was characterized by FESEM (HITACHI, S-4800) at 10 kV or 30 kV.

Magnetization measurement: Magnetization measurements were carried out using a superconducting quantum interference device magnetometer (SQUID, Quantum Design MPMS-XL-5) in the temperature range between 2 and 300 K.

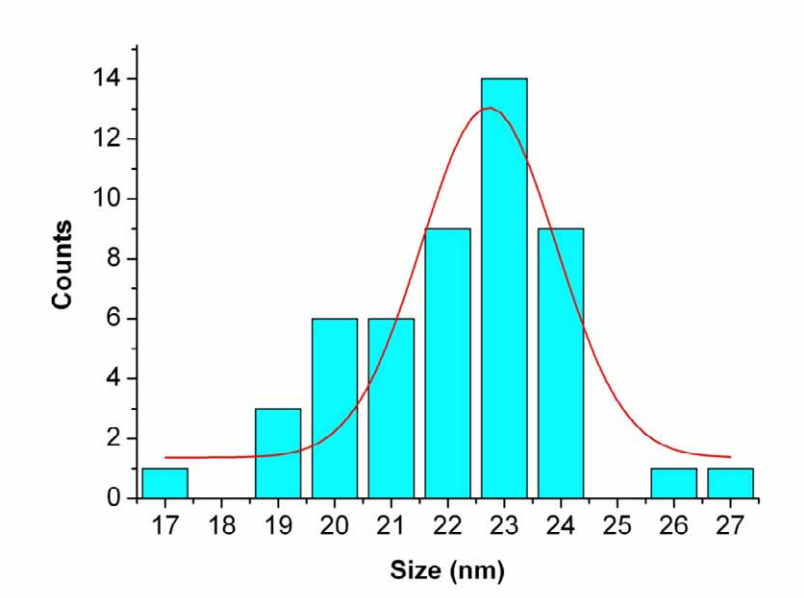

Fig. S1 Histogram of particle size distribution of the octahedra.

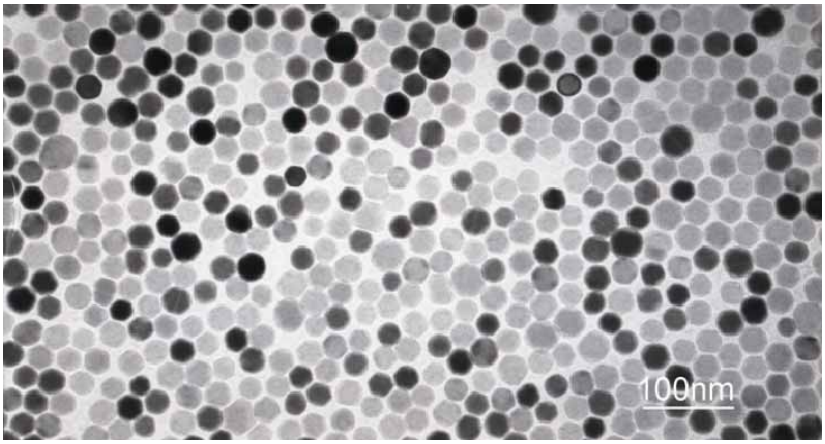

Fig. S2 TEM image of monolayer self-assembled pattern consist of Fe_3O_4 NPs with <111> projection.

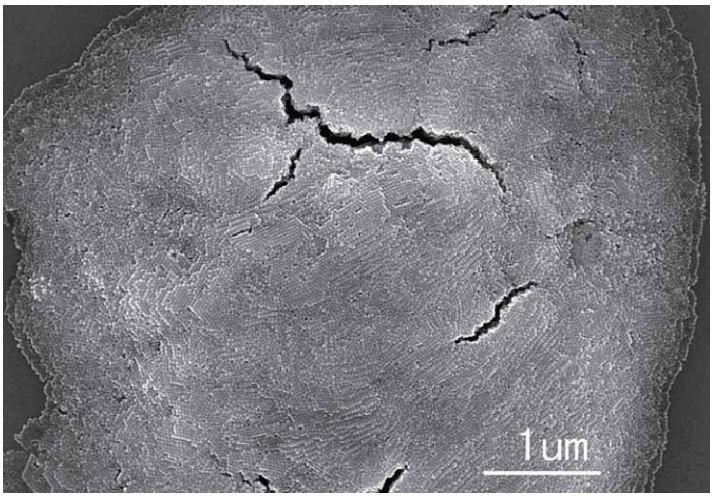

Fig S3 SEM image of super structure of Fe_3O_4 octahedral NPs.

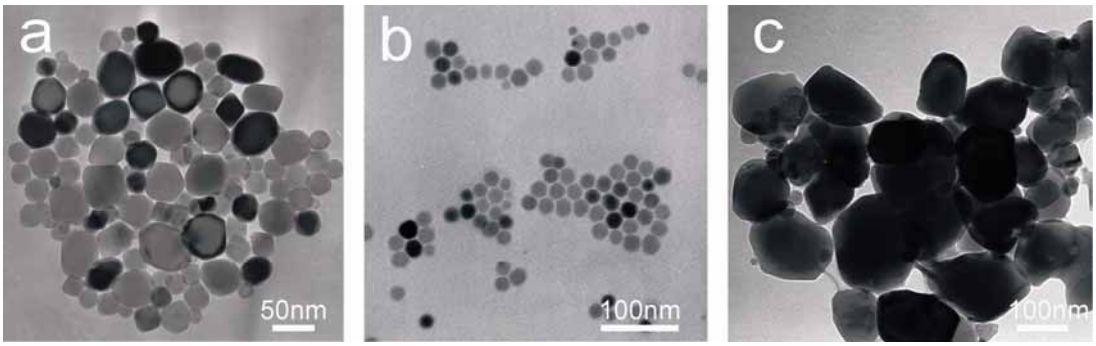

Fig. S4 TEM images of samples, a) octadecyl amine was used as surfactants, b) OAm/$Fe(OA)_3$=4 : 1, c) OAm/$Fe(OA)_3$=1 : 1.

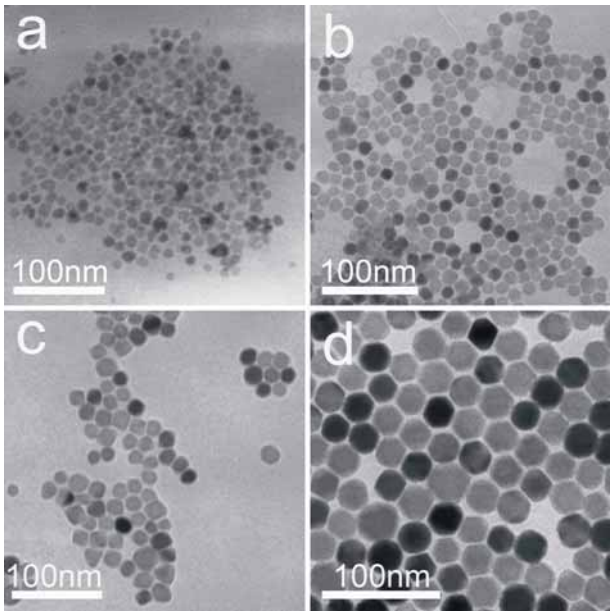

Fig. S5 The morphology at different reaction stages, (a)-(d) corresponding to the reaction temperature of 240, 300, 360 and 380 ^{o}C, respectively.

Reference

1 J. Park, K. J. An, Y. S. Hwang, J. G. Park, H. J. Noh, J. Y. Kim, J. H. Park, N. M. Hwang and T. Hyeon, *Nature Materials*, 2004, 3, 891-895.