Supporting Information

Autoclave-free facile approach to the synthesis of highly tunable nanocrystal clusters for magnetic responsive photonic crystals

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1. Alkali conditions that affect the crystallinity of MNCs

The difference of crystallinity can be easily judged by XRD result. With the increasing amount of NaOH, the diffraction peaks become narrow and strong. Average primary crystals sizes calculated by Debye–Scherrer formula are 11.0nm, 12.4nm, and 22.0nm corresponding to 0.2g, 0.4g, and 0.6g NaOH.

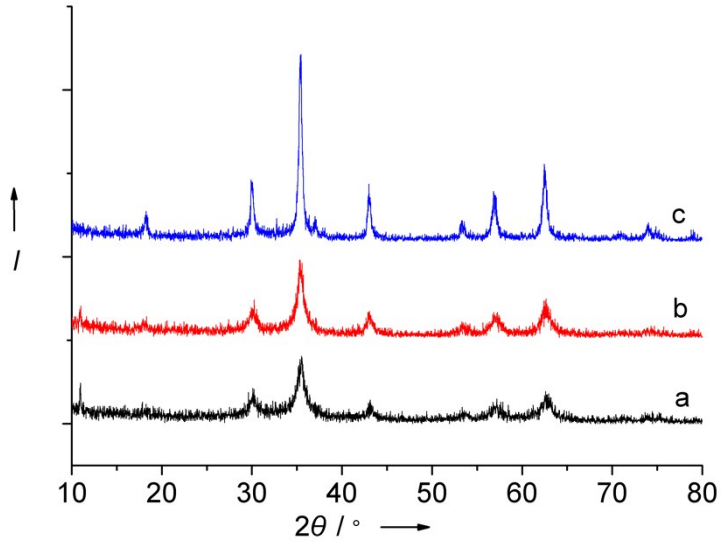

Figure S1 XRD patterns of MNCs prepared by different amount of NaOH. 0.2g, trace a); 0.4g, trace b); 0.6g, trace c).

2. Key factors that affect generation of Fe_3O_4 from ethylene glycol

Even though EG reduction system is widely adopted in the synthesis of MNCs, a detailed research on the mechanism of their generation is seldom done. Thus, five control groups have been designed in order to figure out this problem. In Figure S2, it is clear that only alkali participated reaction is able to generate Fe_3O_4 and the cationic part like Na^+ does not contribute to reaction. According to these results, OH^- groups ionized by alkali probably play an important role in EG reduction system. The thought of RAPW is based on this discovery.

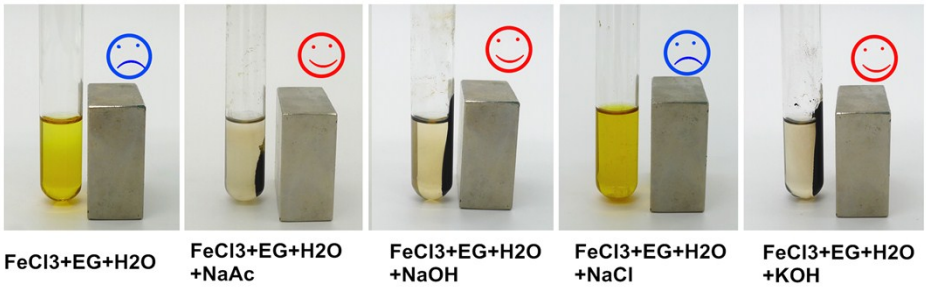

Figure S2 A series of experiments to explore mechanism of Fe_3O_4 generation.

3. DLS result of monodispersed feature of MNCs

		Diam. (nm)	% Intensity	Width (nm)
Z-Average (d.nm): 212	Peak 1:	222	100.0	52.2
PdI: 0.021	Peak 2:	0.00	0.0	0.00
Intercept: 0.908	Peak 3:	0.00	0.0	0.00

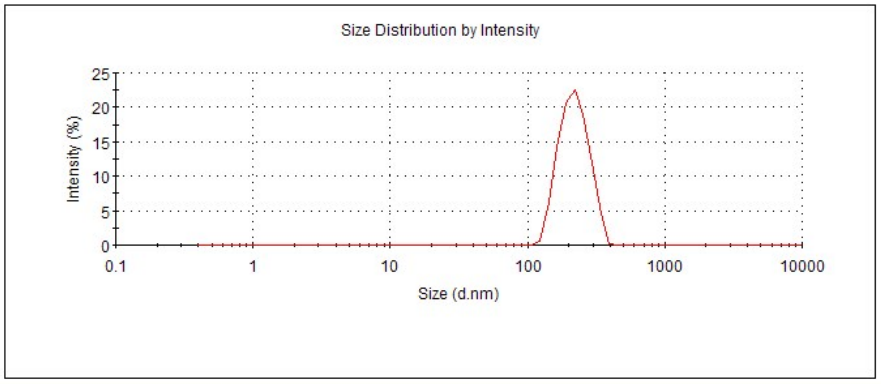

Figure S3 DLS result of MNCs prepared by the recipe No. 6 in table 1.

4. Washing test for glass reactor

The pollution issue can be mostly avoided if we adopt normal glass containers to conduct these experiments. Not only the reflection spectra indicate good repeatability in the synthesis procedure (Figure 5), but also the glass container can be easily cleaned up by pure water (Figure S4) and is promising for industrial applications due to the extreme low cost of reactor.

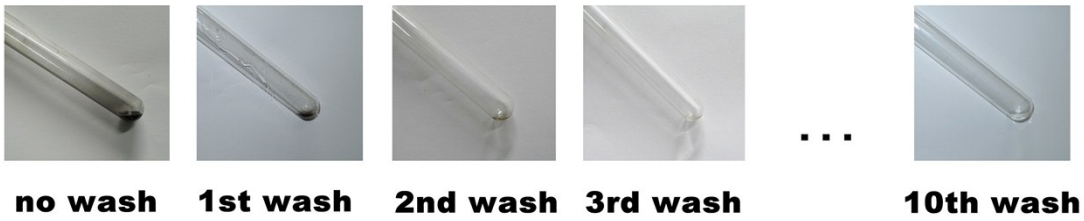

Figure S4 Repetitive wash of glass tube by distilled water.

5. XPS results of MNCs

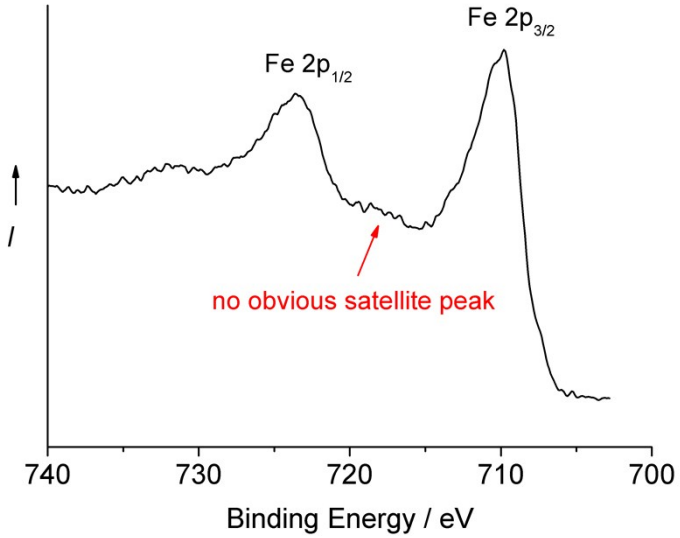

Figure S5 XPS result of MNCs prepared by the recipe No. 6 in table 1.

One of the most distinct differences between Fe_3O_4 and γ–Fe_2O_3 is the satellite peak between Fe 2p1/2 and Fe 2p3/2 peak[1]. Since no obvious satellite peak was found in our XPS result, it can be concluded that the as received MNCs are mostly consisted of Fe_3O_4 phase.

6. Microstructure of silica coated MNCs

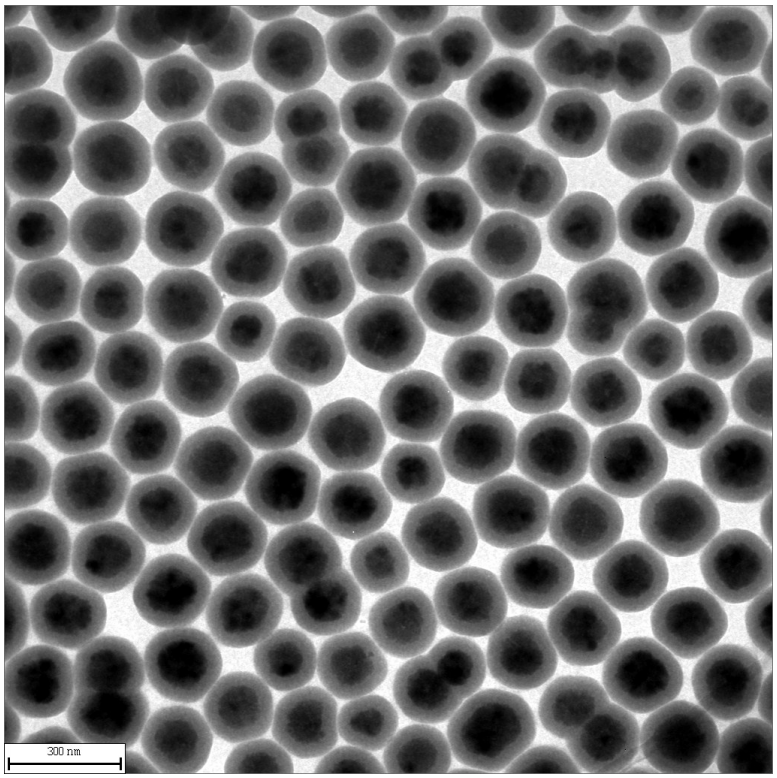

Figure S6 TEM image of silica coated MNCs. (2 times of TEOS injection, total amount is 0.8mL).

7. Dependence between spatial distance and magnetic strength of the NdFeB magnet

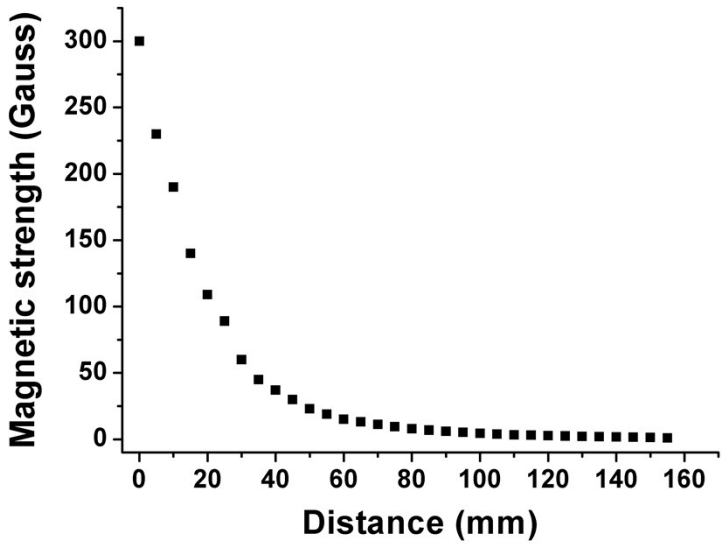

Figure S7 Dependence between spatial distance and magnetic strength of the NdFeB magnet applied in this work.

8. A few details of the measurement of reflection spectra.

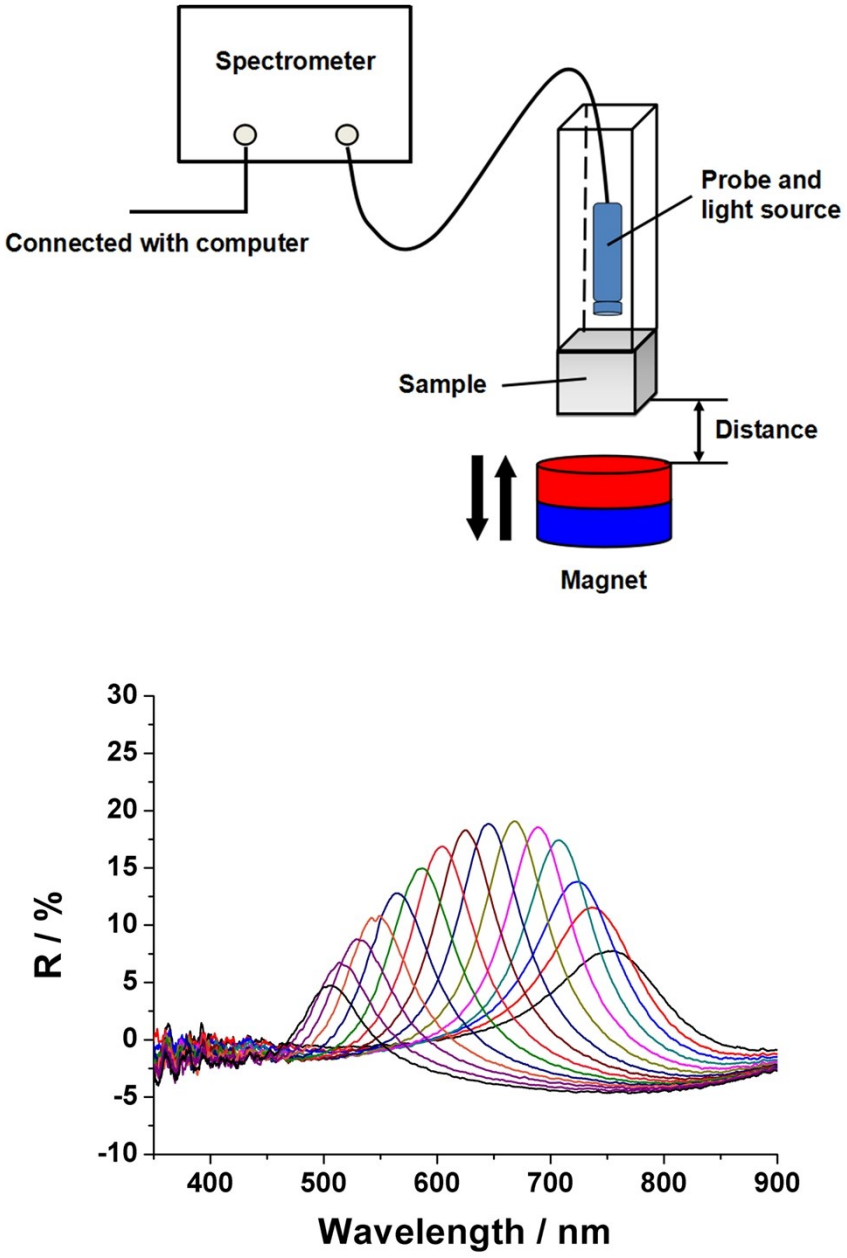

Figure S8 A few details of the measurement of reflection spectra. Schematic of our measure equipment(top) and reflection spectra of a certain product systhesized according to recipe 4 in Table 1. (Note: The spectrometer is calibrated by a standard white board before using. We use our sample as the black background for baseline. The whole characterization of reflection spectra is conducted in a dark room.)

9. High resolution TEM images of an individual MNC.

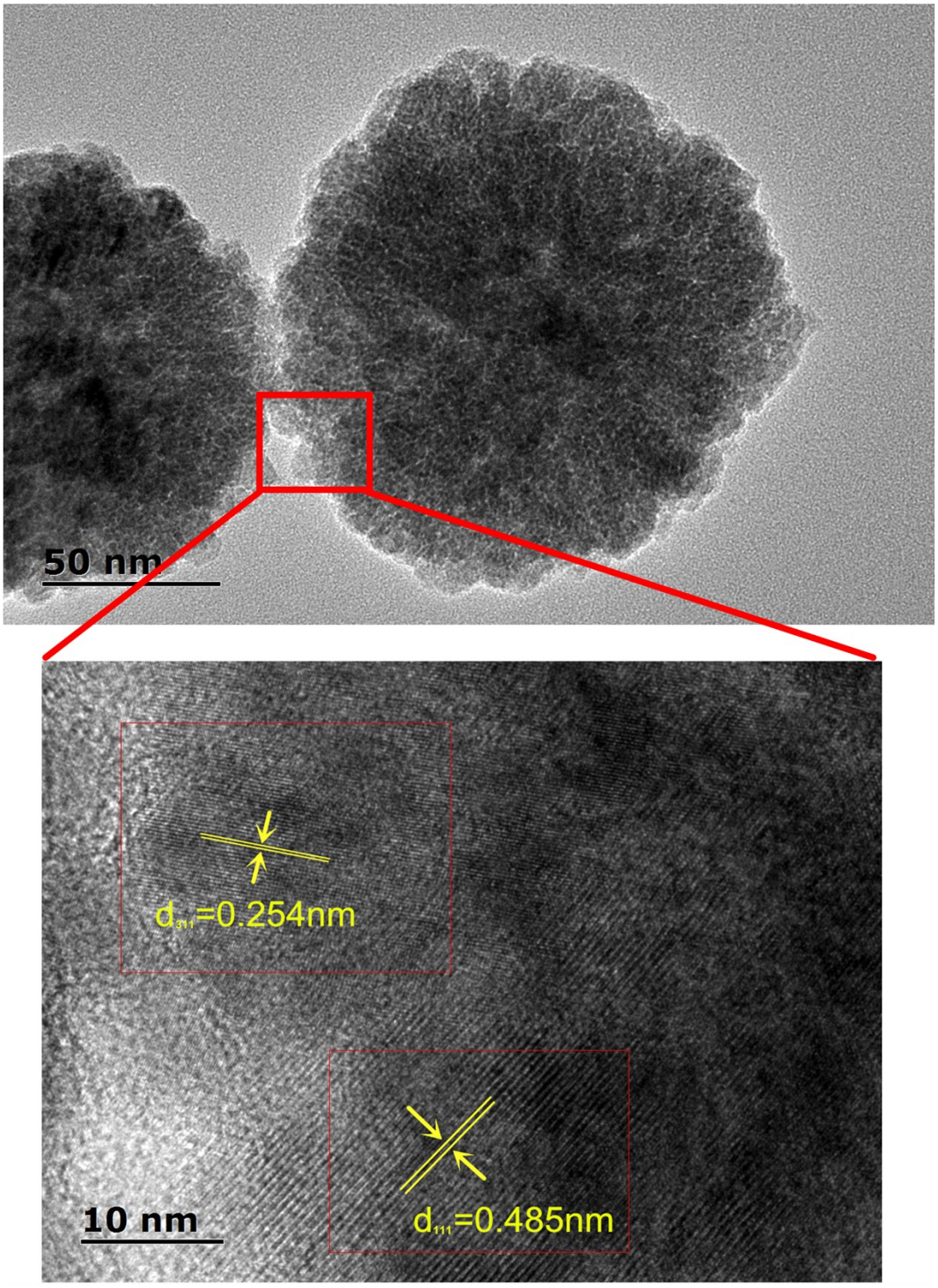

Figure S9 High resolution TEM images of an individual particle (according to recipe 6 in Table 1)

10. Special cases for Sample No. 16 and No. 17

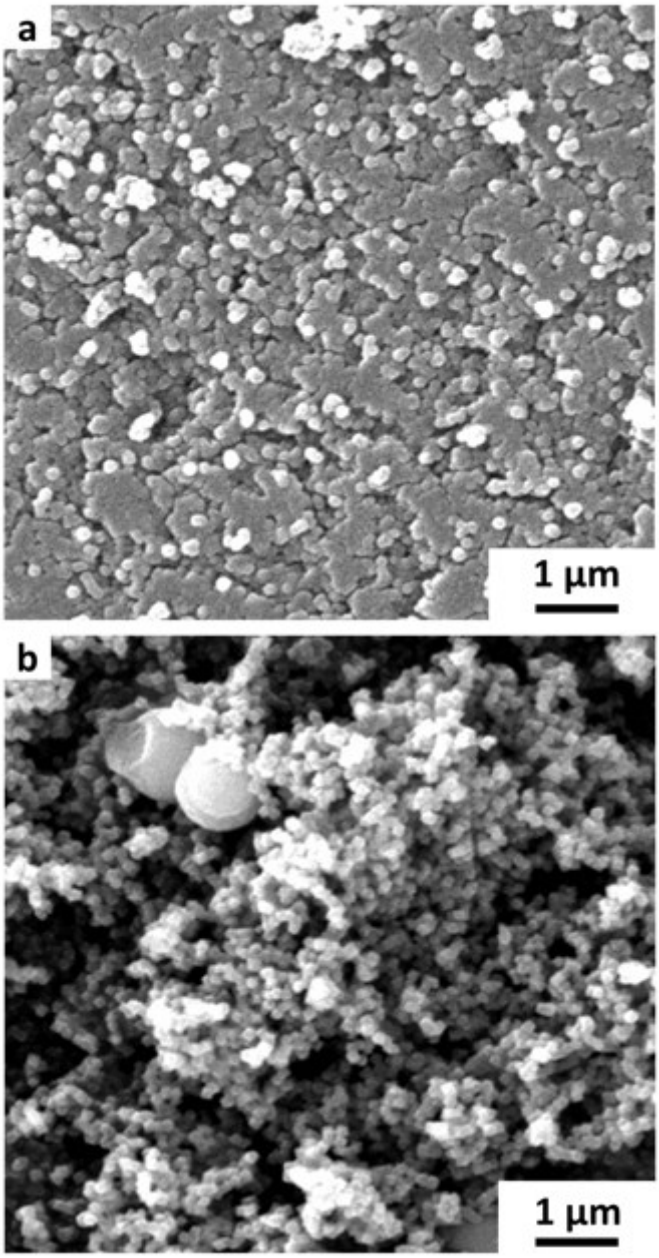

Fig S10 SEM images of sample No. 16 a) and No. 17 b)

Reference

[1] T. Yamashita, P. Hayes, *Appl. Surf. Sci.* **2008**, *254*, 2441.