Supplementary Information

Facile Fabrication of Magnetically Assembled Colloidal Photonic Crystal Film via Radical Polymerization

Aimei You, Yuhua Cao*, Guangqun Cao

The Key Laboratory of Food Colloids and Biotechnology, Ministry of Education, School of Chemical and Material Engineering, Jiangnan University, Wuxi 214122, P. R. China

Synthesis of Fe_3O_4@OA Magnetic Nanoparticles.

Fe_3O_4@OA magnetic nanoparticles were prepared by the classical chemical co-precipitation procedure. $FeCl_3 \cdot 6H_2O$ (4.05 g) and $FeSO_4 \cdot 7H_2O$ (2.78 g) were dissolved with water (100 mL) by vigorous stirring under N_2 gas protection. Once the solution was heated to 90℃, ammonium hydroxide (15 mL) and OA (0.67 g) were rapidly added in sequence. After stirring for 1h, Fe_3O_4@OA magnetic nanoparticles were obtained. Then the Fe_3O_4@OA nanoparticles were separated by means of magnetic aggregation with a magnet. Next, the nanoparticles were washed with water and ethanol, respectively, and dried under vacuum at 50℃ overnight. The dried magnetic nanoparticles were dispersed well in chloroform or cyclohexane.

Preparation of MCNPs by Three-step Miniemulsion Polymerization.

MCNPs were prepared by the three-step miniemulsion polymerization. In the first step, 0.5 g Fe_3O_4@OA were dispersed in 2.5 mL organic solvent, and added drop-wise into 40mL aqueous solution containing 0.05 g SDS under vigorous stirring

for pre-emulsification. After 30 min, the solution was sonicated in ice-water bath for 30 s to get the miniemulsion A. In the second step, 0.1 g MMA and 1.2 g EGDMA were added into 40 mL aqueous solution containing 0.05 g SDS as in step 1 for pre-emulsification. Then the solution was sonicated in ice-water bath for 15 s to get the miniemulsion B. In the third step, a mixture of the magnetite miniemulsion A and the miniemulsion B was sonicated in ice-water bath for 30 s. After that, the miniemulsion was transferred into a three neck-bottomed flask, and heated to 70℃ under an atmosphere of nitrogen. Finally, 10 mg KPS was added to initiate polymerization by stirring at 350 rpm. The polymerization time was 18 h.

FT-IR characteristic of MCNPs.

The functional groups of MCNPs were analyzed by FT-IR, shown in Figure S1. The peaks at 2925 cm^{-1} and 1453 cm^{-1} were characteristic peaks for C-H stretching and bending vibrations. The peak at 1732 cm^{-1} was attributed to the stretching vibration of C=O in ester group in EGDMA and MMA. The peaks at 1162 cm^{-1} was from stretching vibration of C-O-C in EGDMA. The peaks at 1260 cm^{-1} might be characteristic peak of S=O stretching vibration resulted from the surfactant SDS and the KPS during polymerization. The peaks near 590 cm^{-1} were characteristic peaks of Fe-O-Fe in magnetite. All these adsorption peaks confirmed the successful formation of magnetite @ poly(MMA-co-EGDMA) composite.

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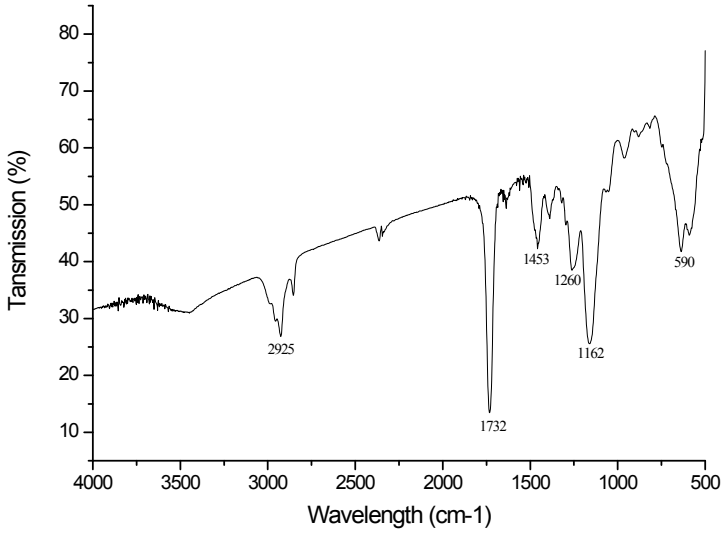

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47 **Fig. S1** FT-IR spectrum of MCNPs

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49 **Table S1** The influence of surfactant concentration on the particle size (D_h),
50 polydispersity indexes (PDI), and the content of magnetite
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Sample	SDS(mmol/L)	D_h (nm)	PDI	TGA (%)
MCNP-1	0.87	296	0.340	33.8
MCNP-2	1.7	166	0.171	38.2
MCNP-3	2.6	162	0.163	39.6
MCNP-4	3.5	152	0.160	48.5
MCNP-5	4.3	152	0.162	45.8
MCNP-6	5.2	148	0.158	45.8
MCNP-7	6.1	145	0.151	56.2
MCNP-8	7.0	146	0.150	60.7

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