

Supporting Information

Double-layered NiPt nanobowls with ultrathin shell synthesized in water at room temperature

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Experimental Section

Synthesis of NiPt nanobowls. All the reagents were analytic grade and used as received and deionized water was served as solvent. In a typical synthesis, 34 mg $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ and 50 mg PVP (M. W. 30000) were dissolved in 20 mL deionized water, sonicated to form clear solution, then transferred into a three-necked flask. The flask was placed on magnetic agitator with stirring rate of 2000 rpm. 20 mL of freshly prepared NaBH_4 solution (10 mg) was then added dropwise. After all of the NaBH_4 has been added, 20 mL of K_2PtCl_6 (0.12 mmol) solution was immediately added dropwise. After 60 min, the product was collected by centrifugation and washed several times with ethanol and water. All reagents were and used as received. The experiments were carried out at room temperature (300 K). The black powder was dried in oven at 335 K.

To investigate the growth mechanism of the as-prepared double-layered NiPt nanobowls, controlled experiments were performed. To evaluate the effect of PVP in the formation of nanobowls, experiments were conducted using 200, 0 mg PVP, respectively, keeping the stirring speed of 2000 rpm and other parameters constant. To clarify the effect of stirring on the morphology, experiments were done with different

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stirring speed of 0, 2000 and 3000 rpm. Besides, to prove the template effect of the as-prepared Ni cores, products before addition of Pt ions were obtained with stirring speed of 0 and 2000 rpm, respectively.

Characterization. The crystal structure, morphology, and chemical composition of NiPt nanobowls were characterized using X-ray diffraction (XRD, X'Pert Pro MPD system, Cu K α), scanning electron microscopy (SEM, Hitachi S-4800), and transmission electron microscopy (TEM, JEOL 2100F with field emission gun and accelerating voltage of 200 kV) equipped with energy-dispersive X-ray spectroscopy (EDS, EDAX). For XRD measurements, powder samples were used. The SEM micrographs were taken with products dispersed in different solution and then dropped onto silicon substrates. The specimen for TEM and HRTEM investigations were prepared through the dispersion of products in ethanol onto the holey grid, and dried in air.

Fluorescence modification of Rhodamine 6G (R6G). 2 mL of the as-prepared NiPt nanobowls in ethanol (containing 0, 1 and 2 mg, respectively) was mixed with 2 mL of R6G in ethanol (3×10^{-5} M). The emission spectra of the R6G solutions doping with different quantity of as-prepared NiPt nanobowls were characterized by luminescence spectrometer (SHIMADZU RF5301-PC). Besides, after removal of NiPt nanobowls by centrifugation, the emission spectra of the R6G solutions were also measured.

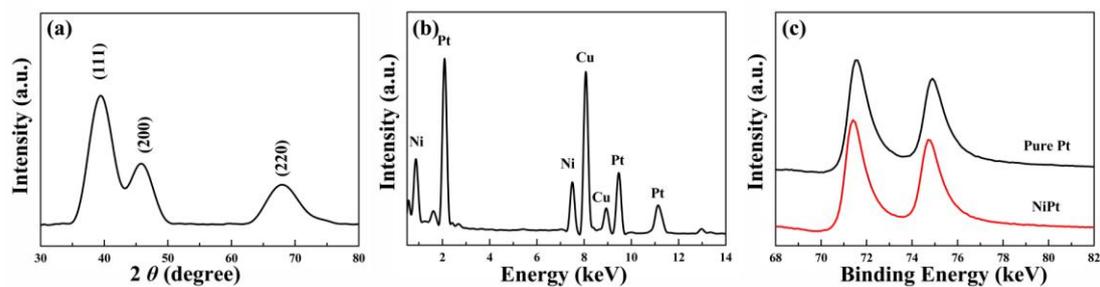


Figure S1. (a) Powder X-ray diffraction (XRD) pattern for the as-synthesized materials; (b) Energy-dispersive X-ray spectroscopy (EDS) spectrum; (c). X-ray photoelectron spectrum of Pt 4*f* for the as-synthesized materials. The black and red lines represent the Pt 4*f* peaks for pure Pt and the NiPt products.

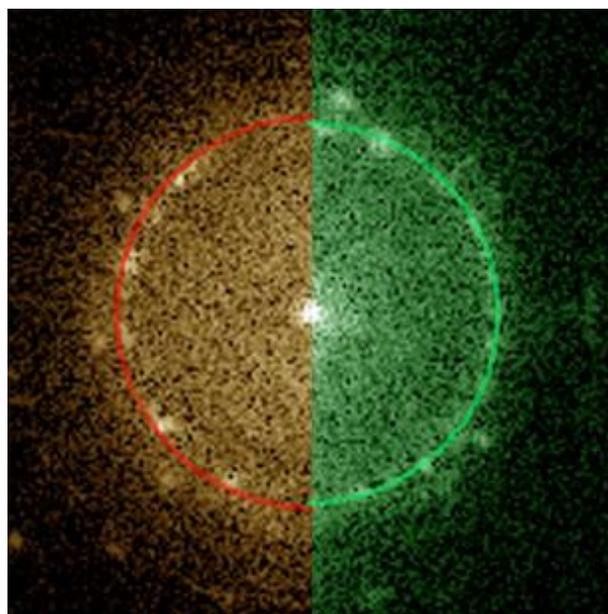


Figure S2. Fast Fourier Transform (FFT) patterns for interior layer (left) and exterior layer (right)

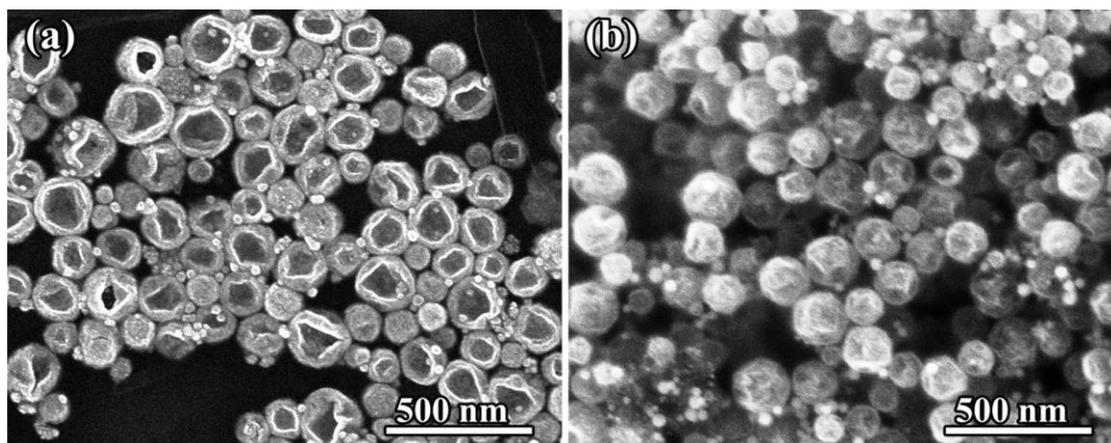


Figure S3. SEM images of the as-prepared NiPt nanobowls dispersed in water (a) and chloroform (b), respectively.

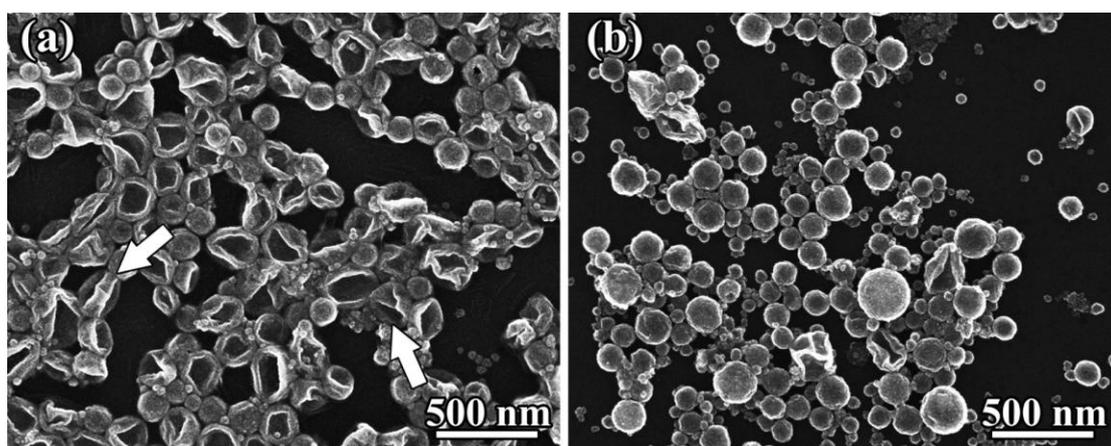


Figure S4. SEM images of the as-prepared product with stirring speed of 3000 rpm (a) and 0 rpm (b), while keeping other parameters constant.

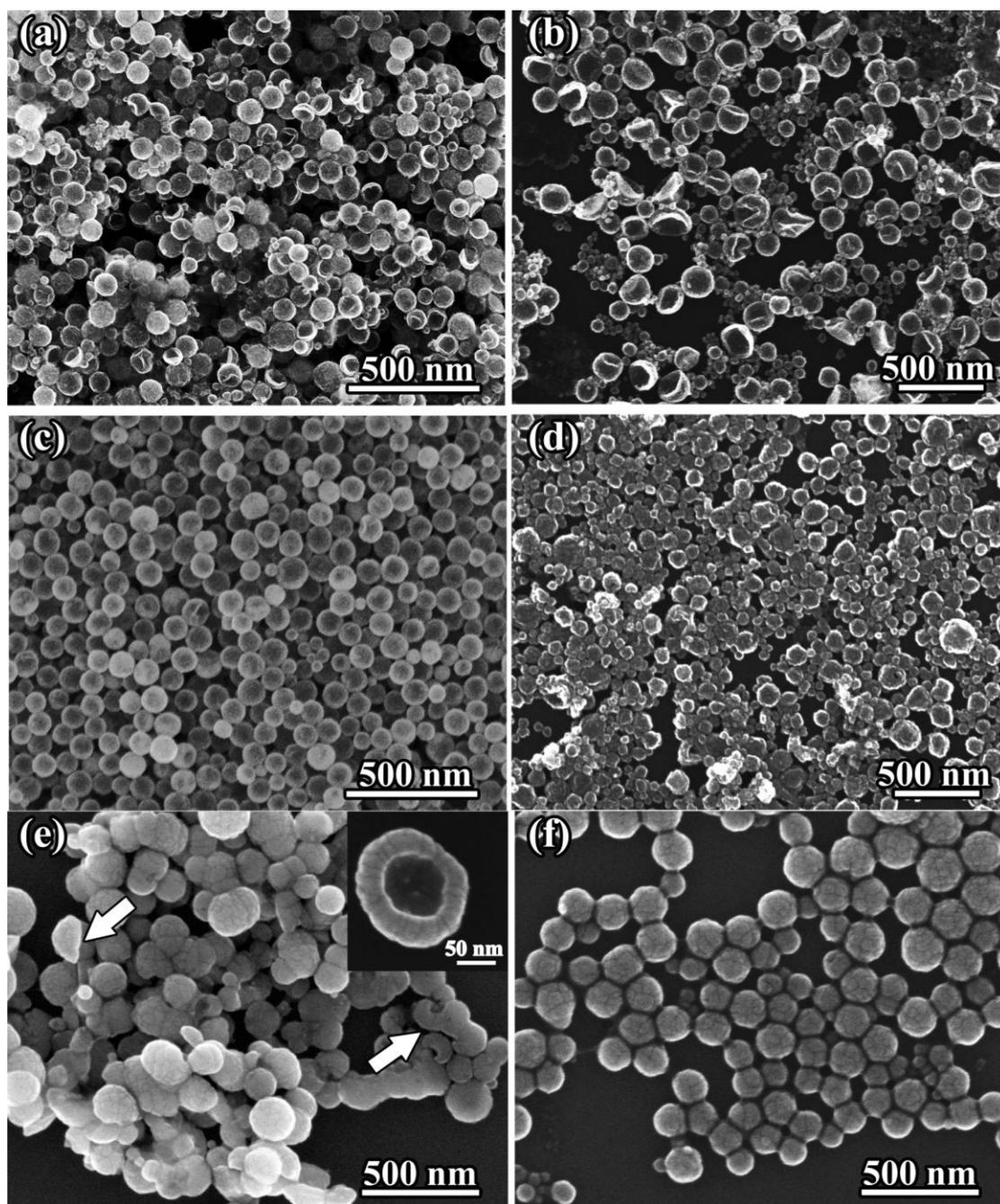


Figure S5. SEM images of samples obtained through controlled experiments. (a and b) the quantity of PVP was 200 and 10 mg with stirring speed of 2000 rpm, respectively; (c and d) the quantity of PVP was 200 and 10 mg without stirring, respectively; (e and f) Bowl-like and sphere-like Ni cores prepared with stirring speed of 2000 rpm and without stirring, respectively.

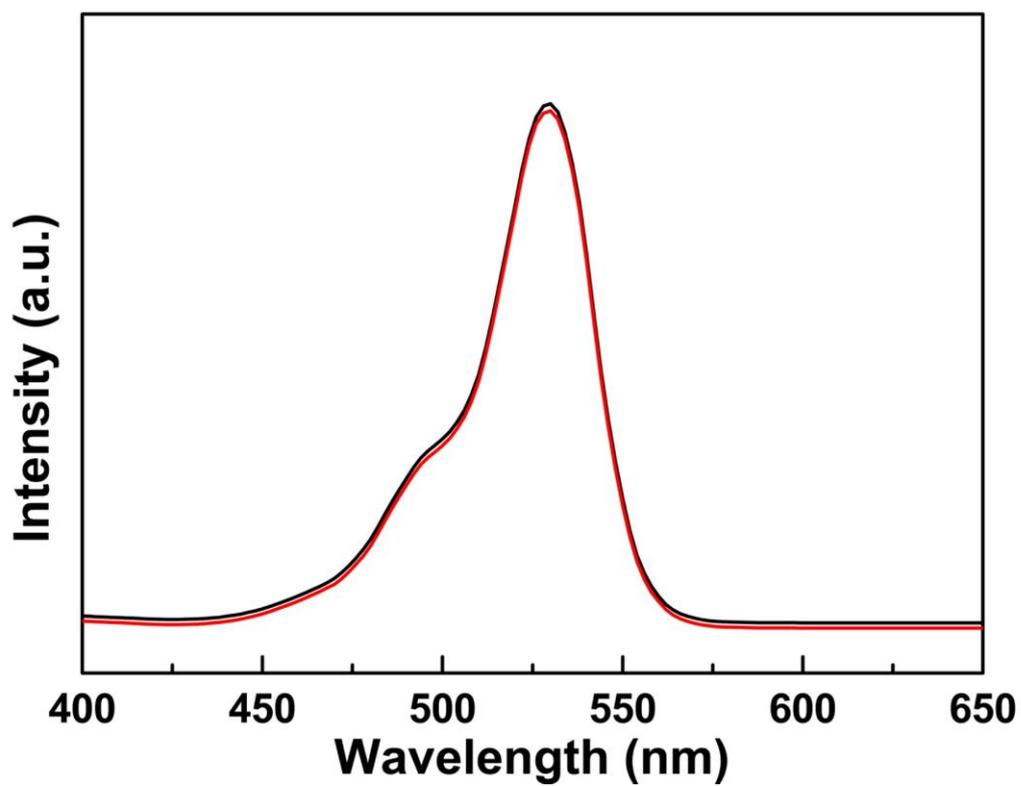


Figure S6. UV - vis absorption spectra of R6G solution in black curve and that of the R6G solution after absorption treatment in red curve.