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Supplementary Information

One-pot preparation of novel asymmetric structure nanoparticles and its application

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Experimental section

Materials

Cetyl trimethyl ammonium bromide (CTAB), Tetraethyl orthosilicate (TEOS) and 4-Nitrophenol (4-NP) were purchased from Sigma-Aldrich. Ammonia, Gold chloride acid ($HAuCl_4 \cdot 4H_2O$) were purchased from Beijing Tianyu Technology Co., Ltd. Auspicious. $HAuCl_4$ solution was kept in the refrigerator for the next step.

The synthesis of gold nanoparticles- mesoporous silica Janus naonoparitcles

50 mg of CTAB is dispersed into 10 ml water and ultrasonic uniformly dispersed for at least 40 min until clarification. The solution was poured into a three-necked flask, followed by adding different amounts of $HAuCl_4$(0.01M) solution, then 0.5 ml of ammonia water was quickly added when the temperature was maintained at 40 ℃ under stirring, and then a certain amount of TEOS was added dropwise into the reaction in a certain speed. The mixture was allowed to react for 30 min. The GNRs-$mSiO_2$ Janus NPs nanoparticles were obtained after quickly washed for 5 times with ethanol (5000 rpm). The resulting solid was washed with methanol and then drying, the solid was finally calcined at 500 ℃ for 1 h.

Characterization

Transmission electron microscopy (TEM) measurements were performed with Hitachi H-8100 microscopes. The morphology of the colloidosomes was characterized using SEM images were obtained with a SKOEL Jeol-7500F. N_2 adsorption–desorption isotherms were obtained at 77 K on a Micromeritics Tristar 2420 analyzer, the specific surface area was determined by the Brunauer-Emmett-Teller (BET) method and the pore size distributions were calculated by the Barrett-Joyner-Halenda (BJH) method. Powder X-ray diffraction (XRD) data were collected on a Rigaku. UV-vis absorption was recorded using SHIMADZU UV-1700. TEM images were observed with a Hitachi H-8100 microscope with an accelerating voltage of 200 kV. HR-TEM images were taken using a JEOL JEM-2100F.

Experimental results Figures

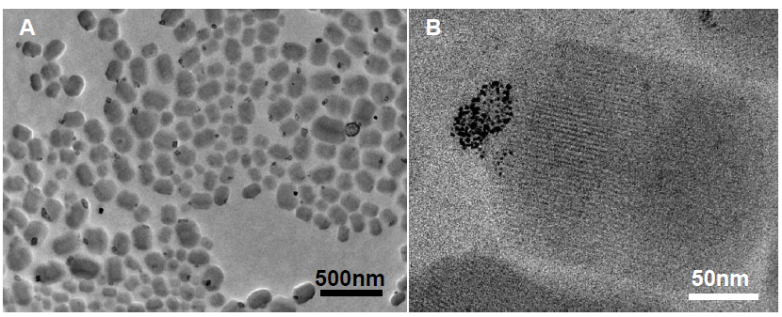

Fig. S1 (A) TEM images of a wide range of Janus Au-$mSiO_2$ nanoparticles precursor. (B) High resolution TEM imgaes of Janus Au-$mSiO_2$ nanoparticles precursor.

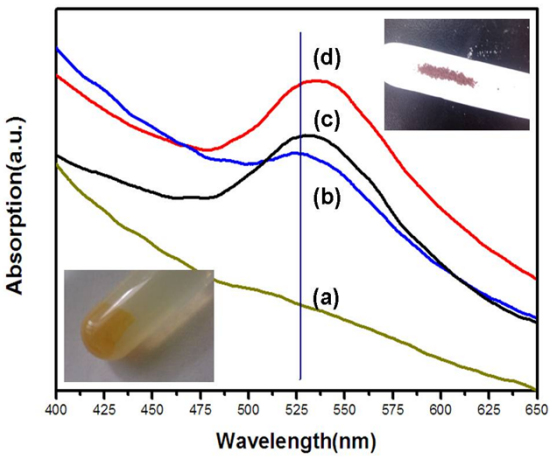

Fig. S2. UV–Vis spectra of Au-mSiO_2 (a) (lower left corner, yellow) and after calcinations (upper right corner, ruby), (b) Au/0.5ml, (c) Au/1ml, (d) Au/1.5ml.

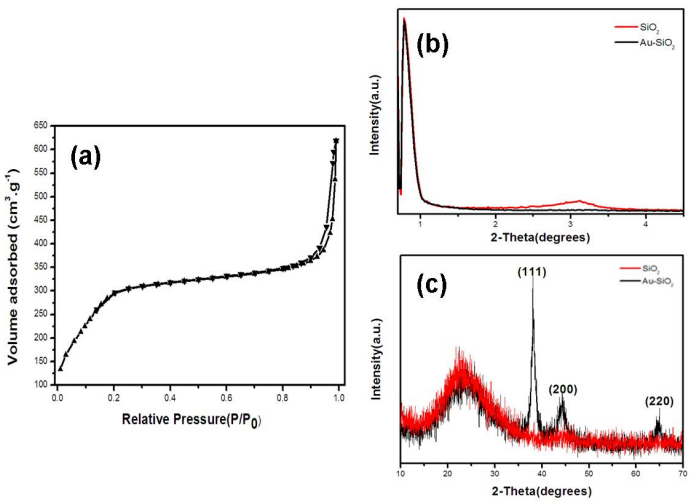

Fig. S3. (a) N2 adsorption isotherm of mesoporous SiO_2 (b) Small-angle XRD patterns of mesoporous SiO_2 and Janus Au-mSiO_2 (c) The wide-angle XRD patterns of mesoporous SiO_2 and Janus Au-mSiO_2.