Supporting Information

Fabrication of SBA-15 Supported Ag@Au-Ag Metal-Core/Alloy-Shell Nanoparticles for CO Oxidation

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Experimental Section

SBA-15 and Ag/SBA-15, Au/BA-15 were prepared according to the literature procedures.[41] Ag@Au-Ag/SBA-15 was prepared as following: 0.2g as-synthesized yellow powder Ag/SBA-15 (4 wt%) was dispersed into the 50 ml water/ethanol solution (volume ratio 1:1), then 1 ml 18.5 mmol $HAuCl_4$ solution (the molar ratio between the Ag nanoparticles and Au^{3+} ion was 4:1) was added. After stirring for 2 hours at 80 ^oC, a light red solution was formed, which indicated the gold ions were completely reduced by the silver nanoparticles. Then the powder was collected by filtration, washed with ammonia, water, centrifugation, and dried in air. Finally we obtained the SBA-15 hosted Ag@Au-Ag bimetallic nanoparticles (molar ratio 1:1). When changing the amount of the precursor of the $HAuCl_4$ (0.5 ml, 0.8 ml, 1ml), we can obtain the Ag@Au-Ag/SBA-15 with different Ag:Au molar ratio (5:1, 2:1, 1:1), which were further confirmed by ICP analysis.

The N_2 adsorption–desorption isotherms were recorded on an ASAP 2000 instrument. TEM images were obtained with a Philips CM 200 Transmission Electron Microscope equipped with a CCD camera. XRD patterns were collected on a Rigaku D/MAX 2400 diffractometer equipped with a CuKa X-ray source. UV–Visible spectrum were determined on a JASCO V-550 UV-Visible spectrophotometer. The scanning wavelength range was 190 – 800 nm and the scanning speed was 100 nm/min. Chemical compositions of the Au-Ag/SBA-15 were analyzed with IRIS Advantage ICP–AES instrument (TJA Co., USA).

The catalytic activities for CO oxidation were evaluated in a fixed-bed quartz tubular reactor. The reactants were fed with a volume ratio of He / CO / O_2 =79/ 1 / 20 (total oxidation). The raw gases were passed over 100 mg of catalyst with a flow rate of 30 ml/min. The temperature of the catalyst bed was monitored with a thermocouple that was put on the center of the reaction bed.

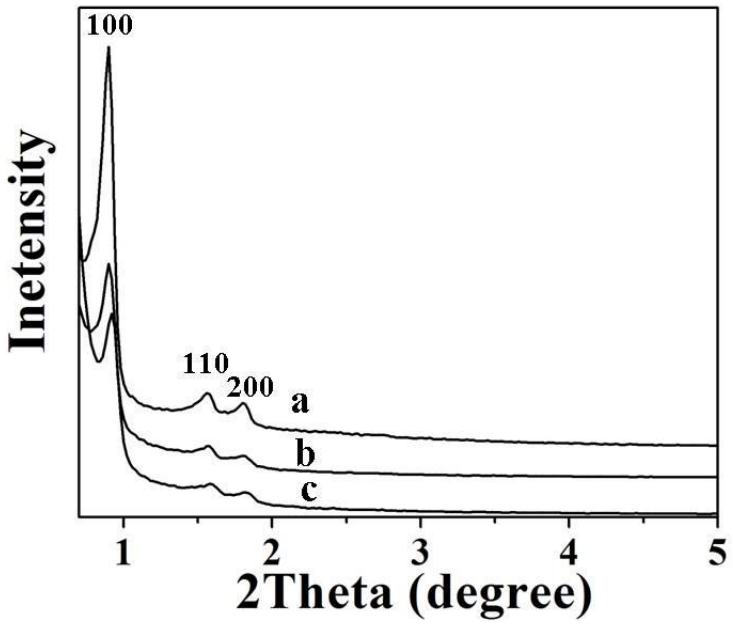

Figure S1. Small angle XRD patterns of parent (a) SBA-15, and (b) Ag/SBA-15, (c) Ag@Au-Ag/SBA-15.

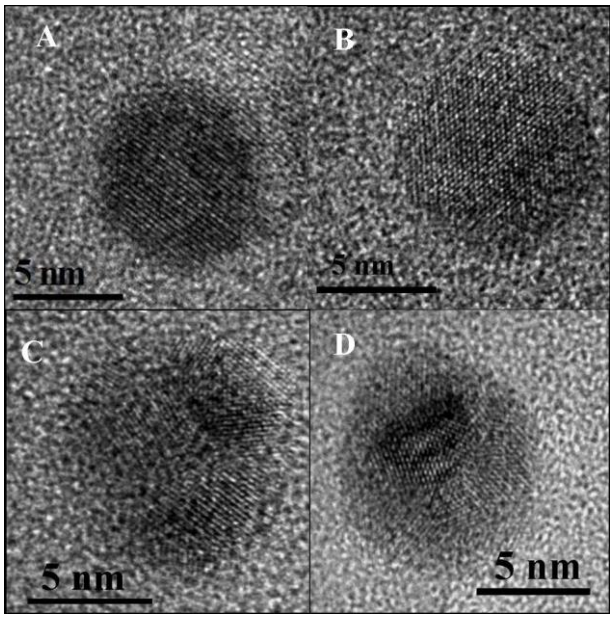

Figure S2. HRTEM images of (A, B) Ag monometallic nanoparticles and (C, D) Ag@Au-Ag bimetallic nanoparticles.

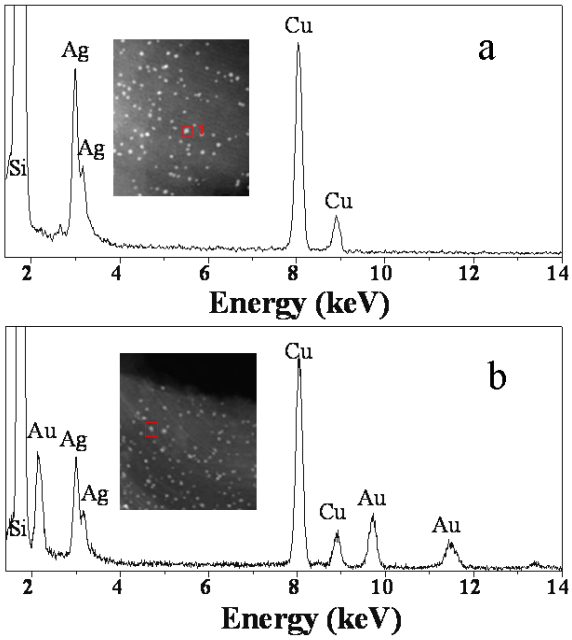

Figure S3. EDX analysis in point modes spectrums of randomly chosen monometallic (a) Ag nanoparticle and (b) Ag@Au-Ag bimetallic nanoparticle (Ag:Au molar ratio1:1).

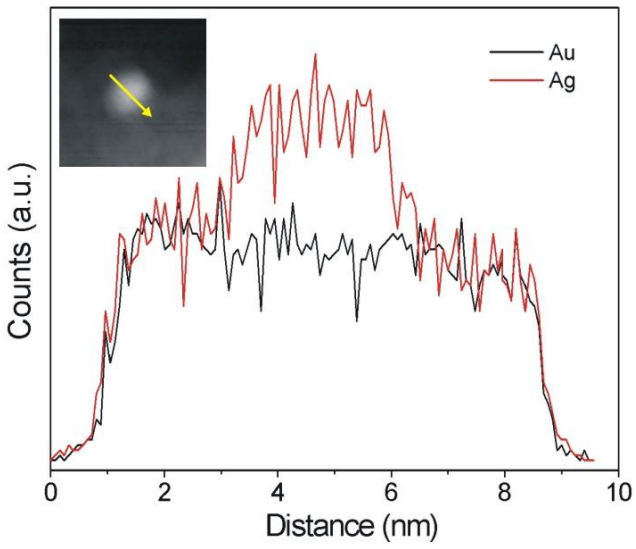

Figure S4. STEM-EDX line-scan analysis of an individual Ag@Au-Ag nanoparticle.

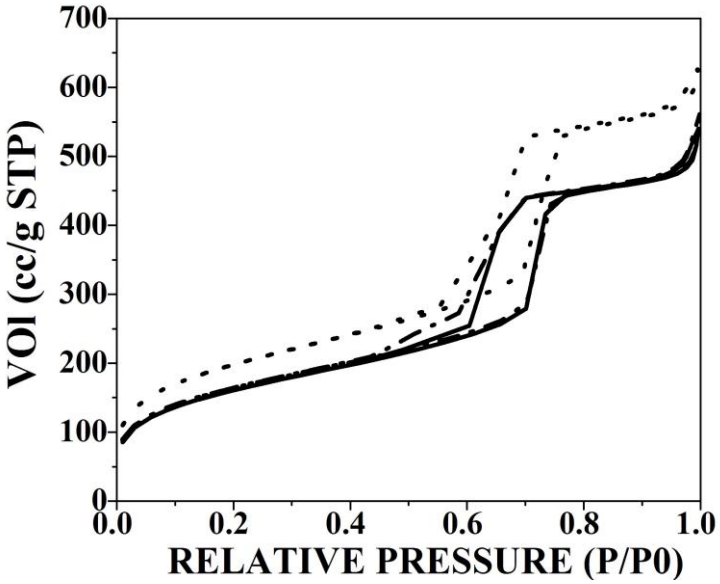

Figure S5. Nitrogen adsoption isotherms of parent SBA-15 (spot line), Ag/SBA-15 (solid line), Ag@Au-Ag/SBA-15 (dash line).

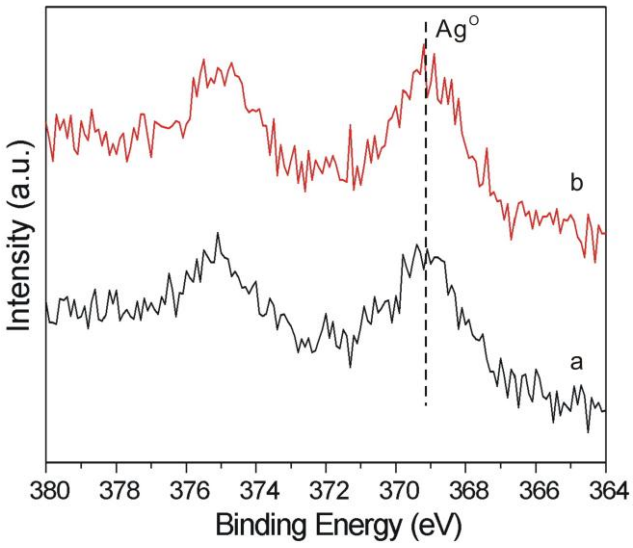

Figure S6. Ag 3d XPS spectra of Ag@Au-Ag/SBA-15 catalyst before (a) and after (b) catalytic reaction.

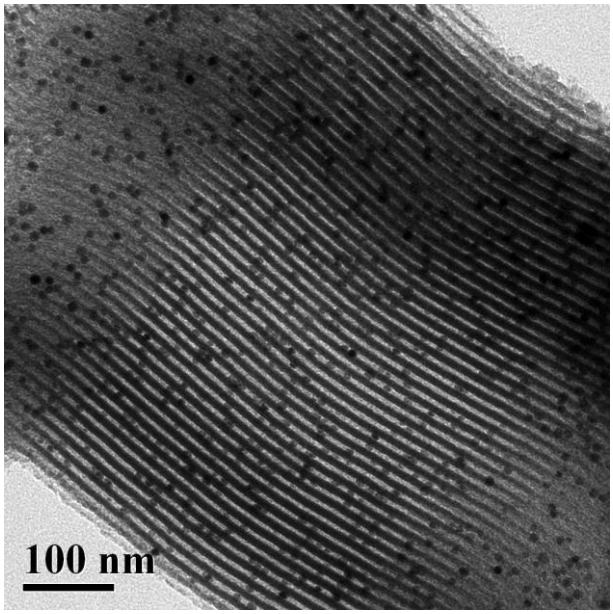

Figure S7. TEM image of the Au/SBA-15 (4 wt%).

Table S1. Physicochemical properties of selected samples

Sample	S_{BJH}/m^2g^{-1}	Vt/m^3g^{-1}	D_{pore}/nm
SBA-15	590	0.92	6.2
Ag/SBA-15	502	0.78	5.6
Ag@Au-Ag/SBA-15	500	0.77	5.6

S_{BJH}, BJH specific surface area; V_t, total pore volume; D_{BJH}, pore diameter calculated using BJH method.