

Supporting Information

Fabrication of bimetallic Cu-Zn adsorbents with high dispersion by using confined space for gas adsorptive separation

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Experimental details

Synthesis of SBA-15. Mesoporous silica SBA-15 was synthesized as follows. In a typical synthesis, 3 g of P123 was firstly dissolved in 90 g of aqueous HCl solution (2 M) and 22.5 g of deionized water with stirring at room temperature. Then 6.38 g of silica source tetraethoxysilane (TEOS) was added to the homogeneous solution and stirred at 40 °C for 24 h, followed by hydrothermal treatment at 100 °C for 24 h. The as-prepared SBA-15 (denoted as AS) was recovered by filtration and dried overnight. After calcination in flowing air at 550 °C for 5 h, the template P123 was removed and calcined SBA-15 (denoted as CS) was obtained.

Characterization. X-ray diffraction (XRD) patterns of the samples were recorded on a Bruker D8 Advance diffractometer with Cu K α radiation in the 2θ ranges from 0.6° to 8° at 40 kV and 30 mA (low-angle) and 5° to 80° at 40 kV and 100 mA (wide-angle). The N₂ adsorption-desorption isotherms were carried out on a BELSORP-MINI at -196 °C. Each sample was pretreated for 3 h at 150 °C prior to testing. The Brunauer-Emmett-Teller (BET) surface area was calculated using adsorption data. The total pore volume was derived from the amount adsorbed at a relative pressure of about 0.99. The pore size distributions were calculated by the Barrett-Joyner-Halenda (BJH) method according to the adsorption branches. The thermogravimetric (TG) curves and their derivatives (DTG) were performed in an air flow from 40°C to 800°C on a thermobalance (STA-449F3, NETZSCH) with the heating rate 20°C·min⁻¹ under a flow of nitrogen. Fourier transform infrared (IR) spectra were recorded on a MICOLET iS10 (Thermo) with a spectrum resolution of 2 cm⁻¹ using transparent KBr pellets. The measurement of transmission electron microscopy (TEM) and elemental mapping were performed on a Philips Analytical FEI Tecnai 30 electron microscope operated at an acceleration voltage of 300 kV.

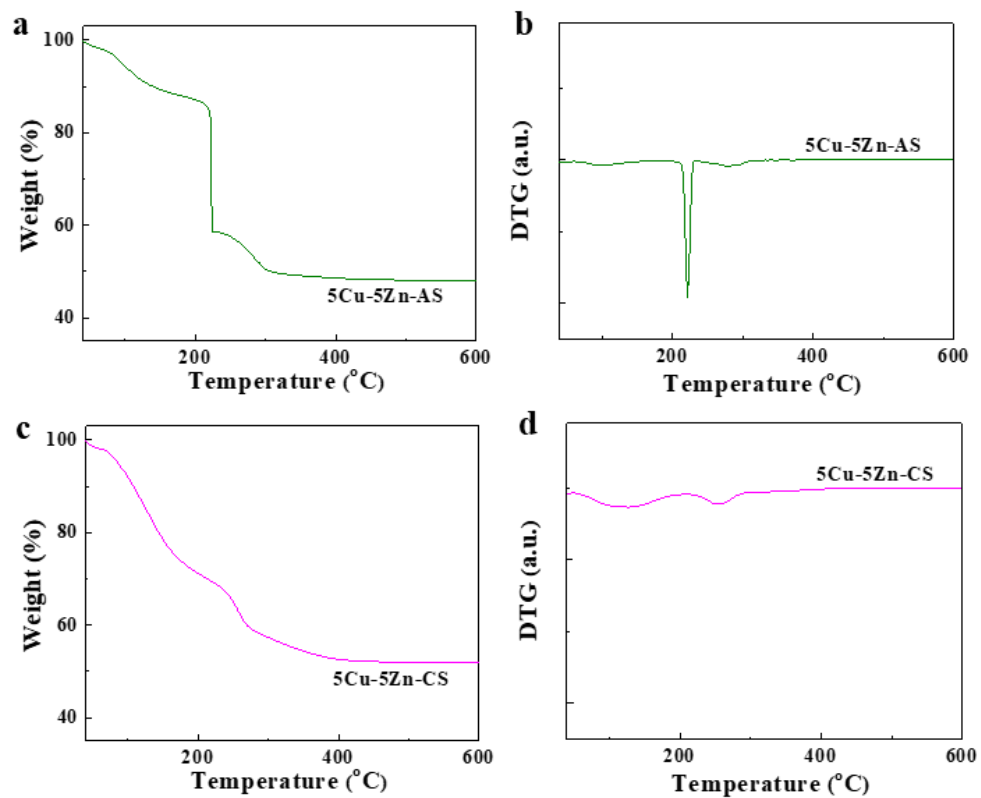


Figure S1. (a) TG and (b) DTG curves of 5Cu-5Zn-AS before calcination; (c) TG and (d) DTG curves of 5Cu-5Zn-CS before calcination.

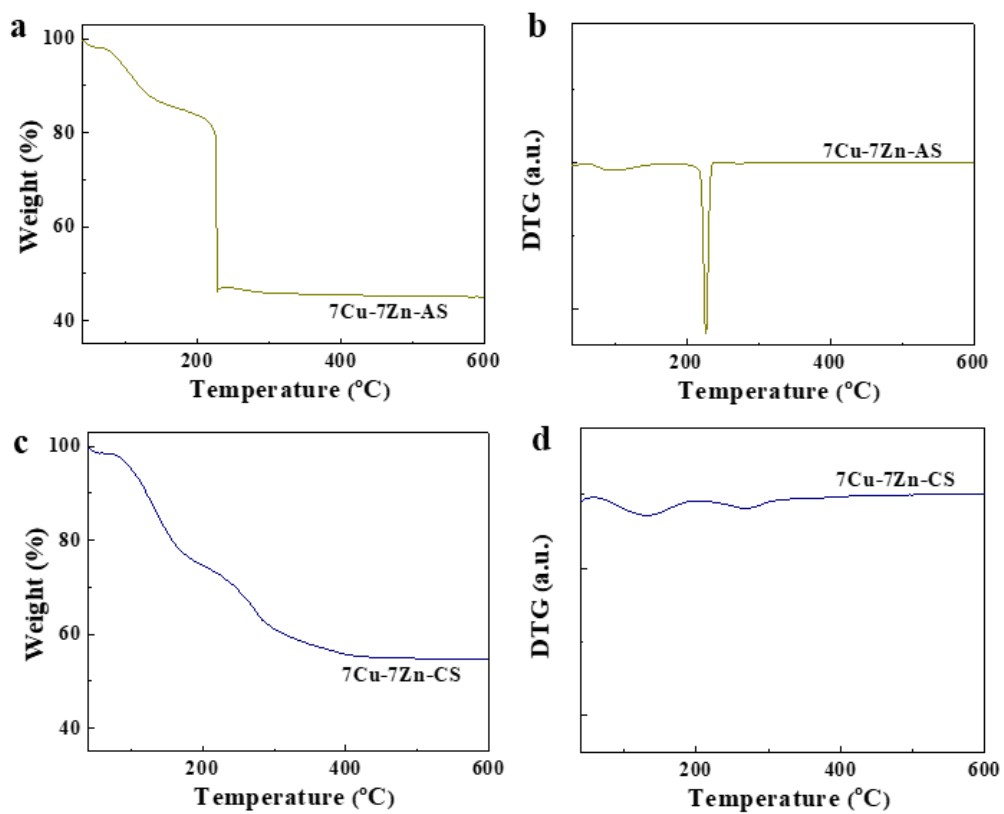


Figure S2. (a) TG and (b) DTG curves of 7Cu-7Zn-AS before calcination; (c) TG and (d) DTG curves of 7Cu-7Zn-CS before calcination.

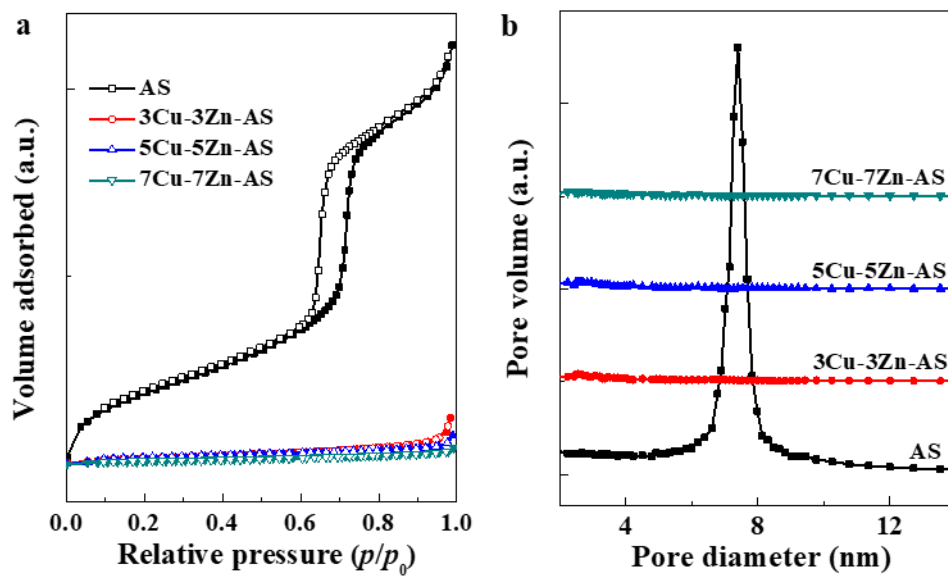


Figure S3. (a) N₂ adsorption-desorption isotherms and the corresponding (b) pore size distributions of AS and Cu-Zn-AS before calcination.