

SUPPORTING INFORMATION: Electronic Supplementary Information (ESI) available

Experimental details:

A The procedure of Cu NWs from SBA-15 through a vapor infiltration preparation. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (0.066 g) and SBA-15 (0.100 g) were dissolved in distilled water (18 mL) in an Erlenmeyer flask and then the solution was placed under a negative pressure for 24 h to incorporate metal species into SBA-15 by capillary force. After that the Cu-incorporated SBA-15 was placed into a beaker with 0.5 g of DMAB and followed by vigorous mixing for 15 min by magnetic stirrer. The emulsion was placed in a teflon-lined stainless steel autoclave of 150 mL capacity. The autoclave was rested at 40° C for 7-8 d under autogenous pressure and then allowed to cool to room temperature. The resulting black solution was centrifuged (2000 rpm) or vacuum filtration and afterwards washed with deionized water and ethanol sequentially.

B Cu NWs via the ethylene glycol (EG) solvothermal reduction in the presence of PVP. 15 mL of freshly prepared $\text{Cu}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ solution (0.435 g in EG) was injected into 30 mL of PVP solution (0.675 g in EG) prepared before at a rate of 45 mL/h with magnetic stirring. The mixture solution was then kept in a teflon-lined stainless steel autoclave of 150 mL capacity at a temperature of 160° C for 24 h. The brownish red precipitate was isolated by centrifugation at 11000 rpm, washed several times with distilled water and alcohol, the whole process of reaction in the protection of nitrogen and the nanowires obtained finally kept in ethanol at room temperature.

C Cu@C NWs preparation process via the glucose hydrothermal reduction in the presence of CTAB. Add $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (3.144 g) with glucose (2.495 g) in an aqueous solution containing ammonia used to regulate pH=11. Then CTAB (1.440 g) was added to the water solution followed by vigorous mixing for 0.5 h by magnetic stirrer until a dark blue emulsion was obtained. The emulsion was added to a reaction flask and heated at 150° C for 15 h under autogenous pressure. The resulting reddish brown

(foxy color) solution was centrifuged (2000 rpm) and then washed with deionized water and ethanol several times sequentially.

1. TEM images of copper nanowires filled in channels of SBA-15 fabricated with vapor infiltration method.

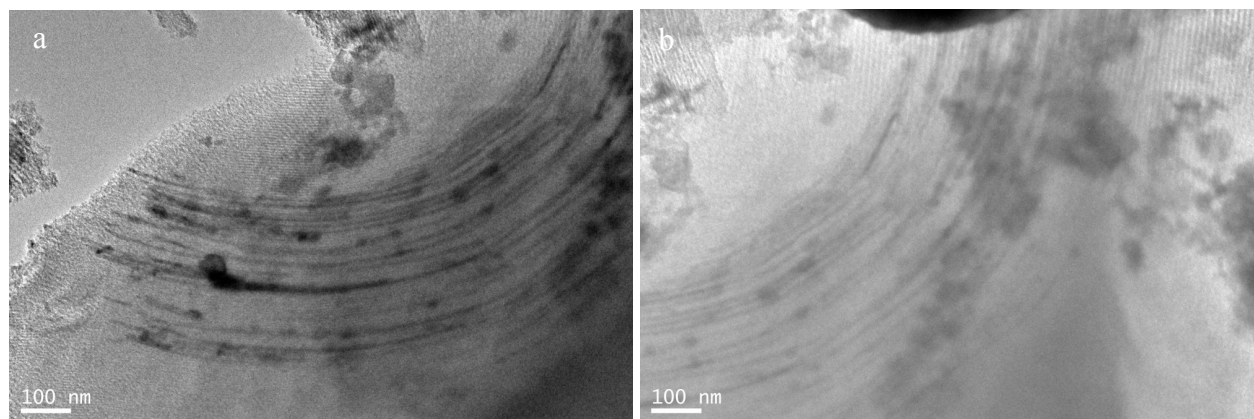


Figure 1. (a, b) TEM image of Cu/SBA-15 composite synthesized by vapor infiltration method at 40° C for 7 d in different selected areas.

2. TEM, SEM and HRTEM characterization of copper nanowires synthesized via the ethylene glycol (EG) solvothermal reduction in the presence of PVP.

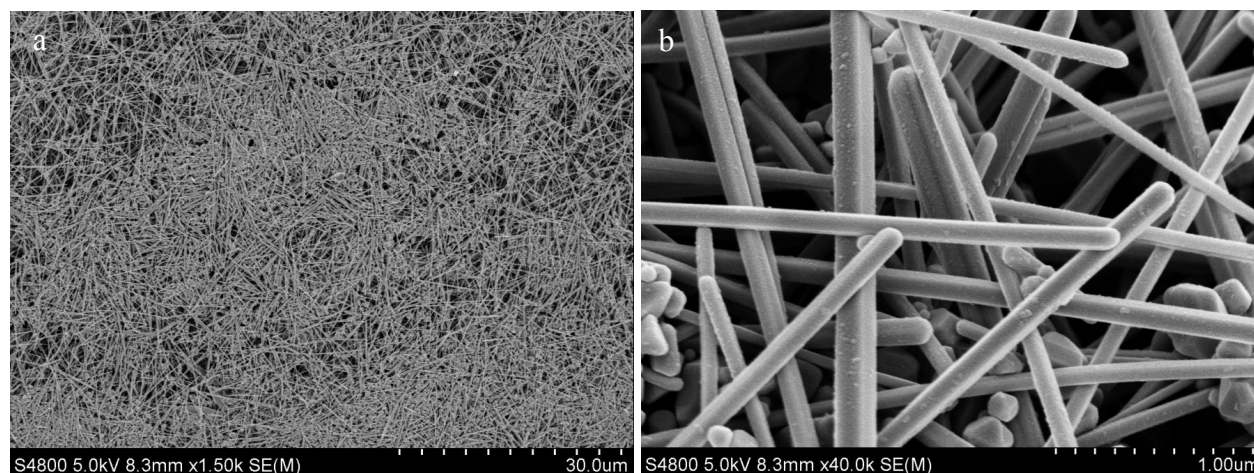


Figure 2. SEM images of copper nanowires synthesized by a polyol-thermal approach at 160° C for 24 h in the presence of PVP separated by centrifugation at 10000 rpm.

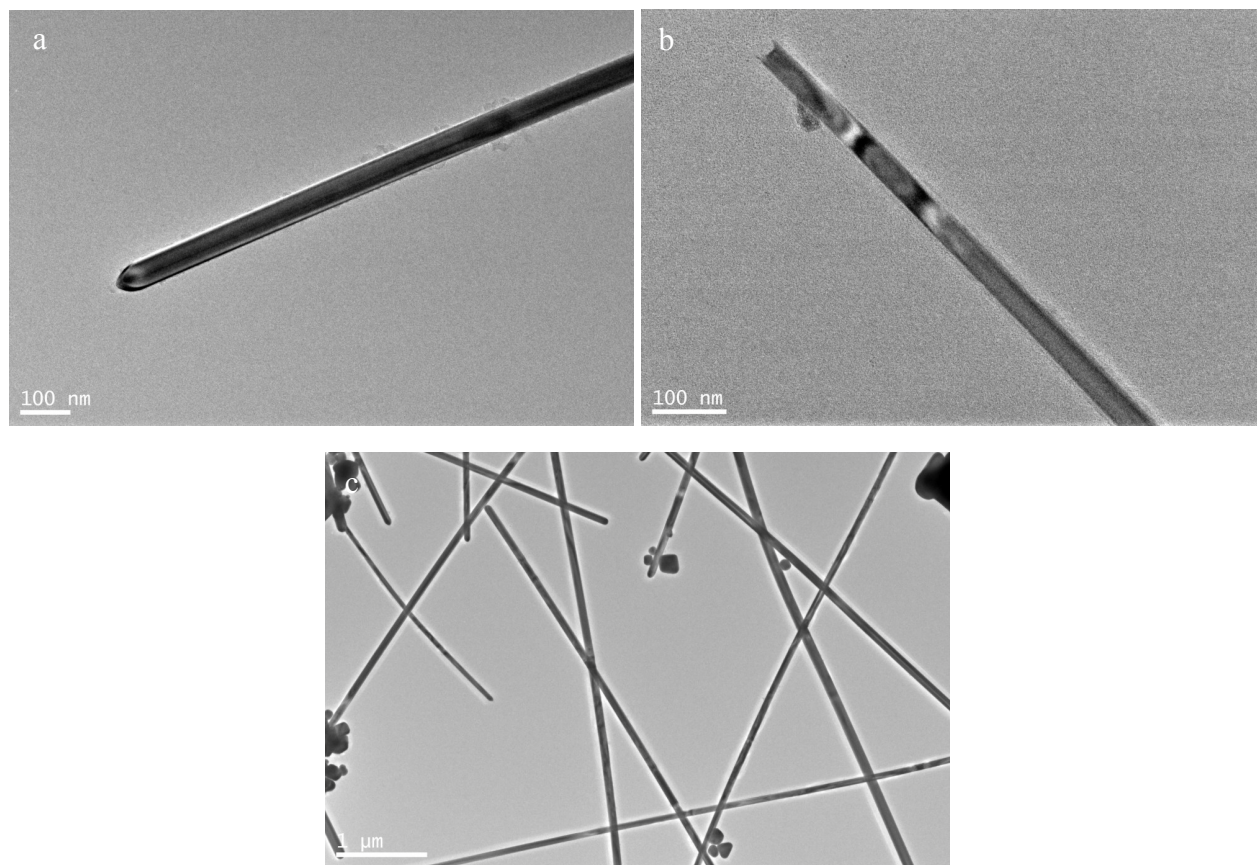


Figure 3. TEM images of a single copper nanowires with the diameter of 50 nm or less.

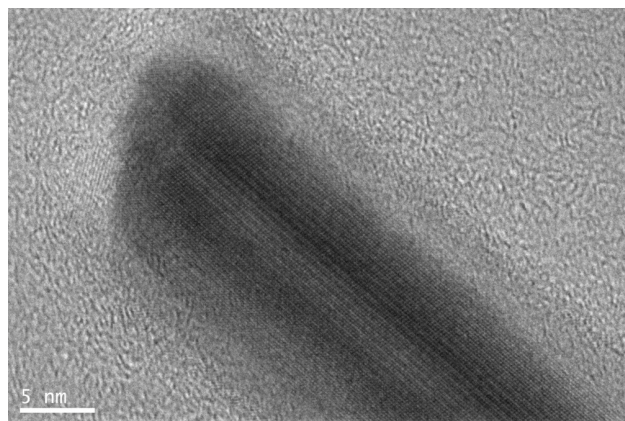


Figure 4. HRTEM image of a nanowire with sizes of 14 nm.

3. TEM, SEM and HRTEM images of Cu@C nanowires fabricated by hydrothermal method induced by glucose and CTAB.



Figure 5. SEM image of general view of Cu@C nanowires prepared at 150°C for 15 h.

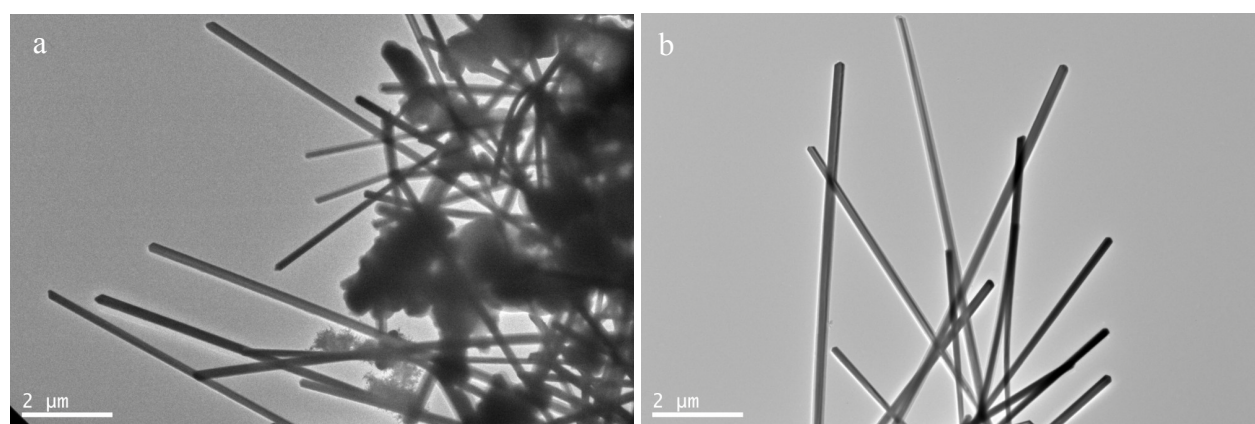


Figure 6. TEM of general Cu@C nanowires.

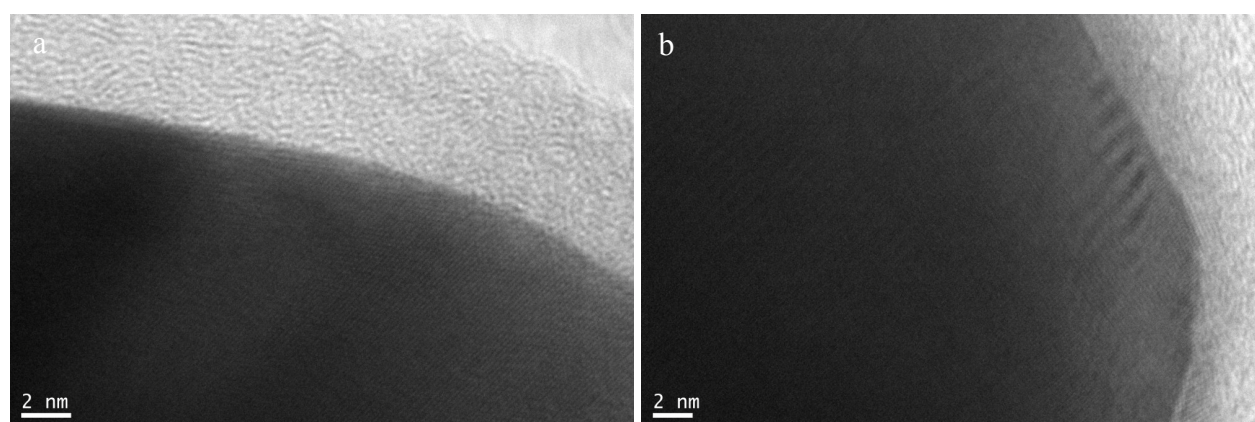


Figure 7. HRTEM image of a Cu@C nanowire.