

Supporting Information for Manuscript Entitled with

## Synthesis of Non-oxidative Copper Nanoparticles

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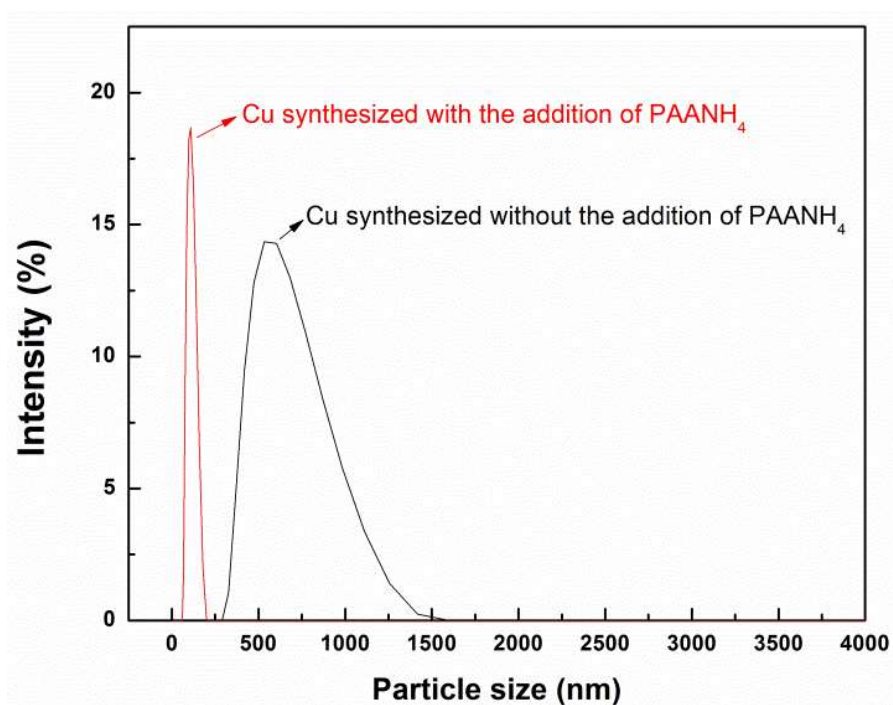
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## Experimental Section

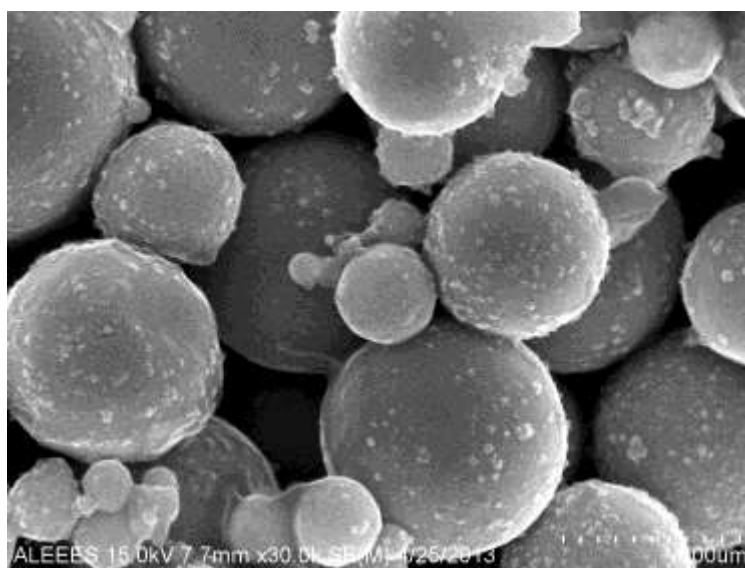
AR grade chemical reagents were used without further purification. In a typical conventional synthesis of Cu nanopowders,  $2.5 \times 10^{-2}$  mol/L copper (II) nitrate trihydrate ( $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ ; Showa Chemicals, Japan) was added to 230 mL of a  $7.5 \times 10^{-2}$  mol/L aqueous solution of hydrazine hydrate ( $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ ; Kanto Chemical Co., Japan) at an equilibrium pH of 11. The pH was adjusted with an ammonium solution ( $\text{NH}_4\text{OH}_{(\text{aq})}$ ; 28%, Showa Chemicals, Japan). After reaction under mild agitation with stirring rate of  $\sim 250$  rpm at  $70^\circ\text{C}$  for 30 min, a brown powder precipitated. The powder was separated by filtration, washed with deionized water and acetone to remove any possible remnant ions, dried in the oven under vacuuming for 6 hours at room temperature and then stored in a desiccator. For the synthesis of Cu nanopowders using a capping layer, the as-received organic solvent *n*-octane (Tedia Co., USA) was poured on the top of the reduction system prior to the addition of  $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ , and then the following experimental steps and conditions are the same as stated in above. The commercially available compound ammonium poly(acrylic acid) (PAA- $\text{NH}_4$ ; Darvan-821A, R.T. Vanderbilt, CT) with an average molecular weight of 6,000 g/mol was used as a dispersant for the Cu nanopowder. A commercial Cu powder (Lot. 11082301, Force Applied Material Technology Co., Taoyuan, Taiwan) was used for the comparison with the as-synthesized ones.

X-ray diffraction (XRD) patterns of the as-synthesized powders were examined using an X-ray diffractometer (MXP18, MAC Science, Japan) with Cu  $\text{K}\alpha$  radiation. The morphology and the primary particle size of the powders were examined using a field emission scanning electron microscope (S-4000, Hitachi, Japan), and the particle size distributions of powders in deionized water were measured by the light-scattering (LA300, Horiba, Japan) method. For measuring electrical resistance, the synthesized Cu nanopowders were first pressed into sheets with an approximate thickness of 1 mm, and the electrical resistance was estimated using the four-point probe method (MCP-T610, Mitsubishi, Japan).

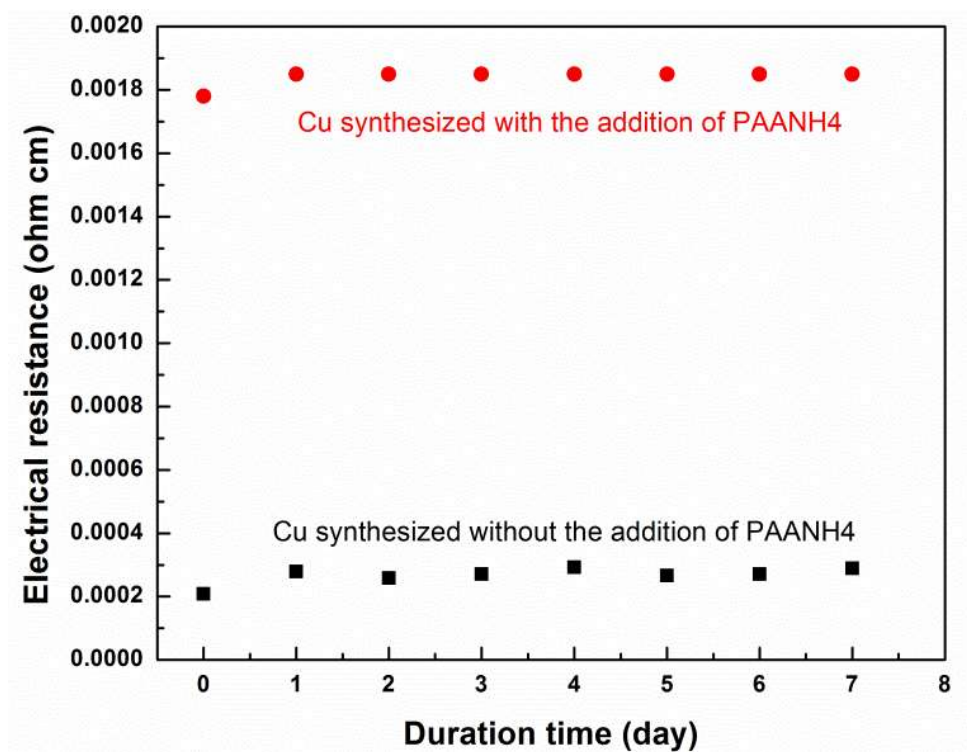
## Additional Results



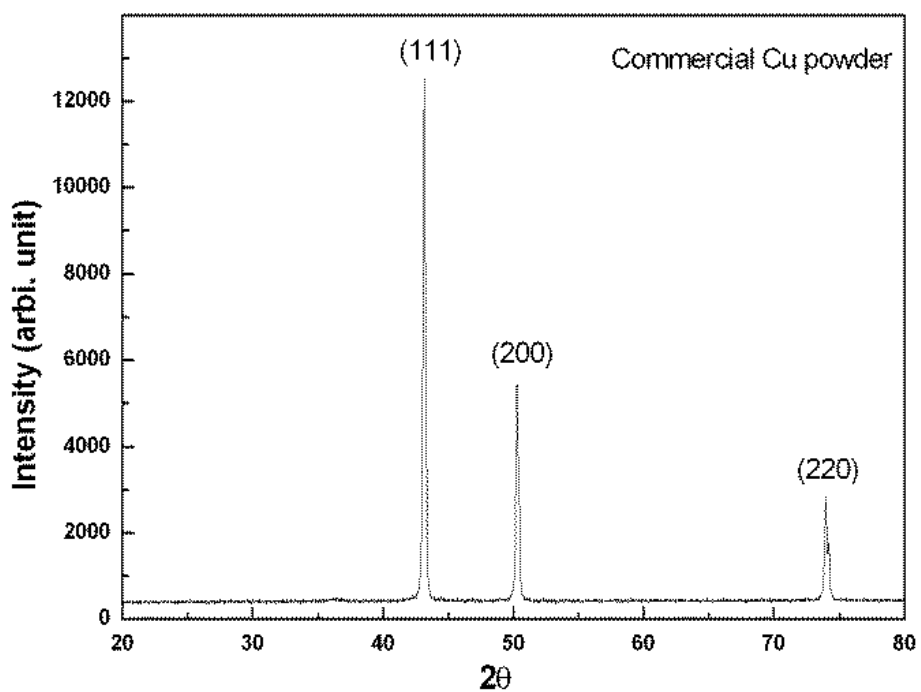
**Fig. S1** Particle size distributions of the Cu nanopowders synthesized with the use of capping solvent (*n*-octane) in the presence and absence of PAA-NH<sub>4</sub> additions, which median sizes ( $d_{50}$ ) are 105 and 535 nm, respectively.



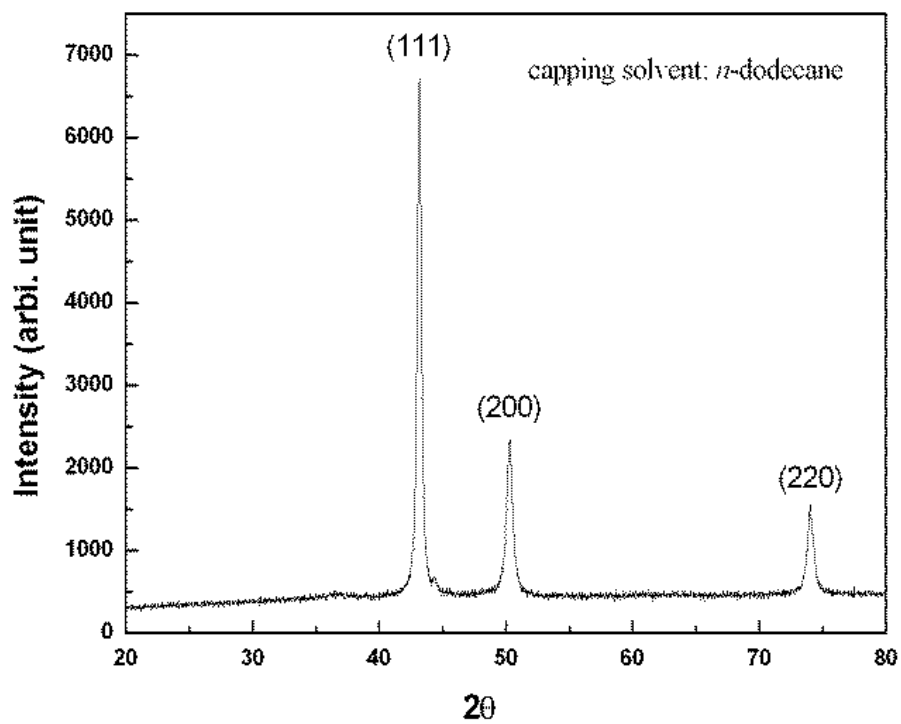
**Fig. S2** Microstructure of the commercial Cu powder.



**Fig. S3** Electrical resistances of Cu nanopowders synthesized with the use of capping solvent (*n*-octane) in the presence and absence of PAA-NH<sub>4</sub> additions as a function of the duration day.



**Fig. S4** XRD spectrum of the commercial Cu powder.



**Fig. S5** XRD spectrum of the Cu nanopowder synthesized via the method with capping solvent of *n*-dodecane.