Electronic Supplementary Information

Facile Fabrication of $Cu(OH)_2$ and CuO Nanoribbon Arrays by Silver-Mediated Oxidation

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Experiment section

Materials

$AgNO_3$, Na_2O_2 and HCl were obtained from Chengdu Chemical Reagent Factory (Chengdu, China). High purity copper foils (Cu, 99.999%) were from shanghai Chemical Reagent Co.(shanghai, China), All reactants were analytical pure and used without further purification. Doubly distilled water was used through out the experiment.

Instruments and Characterization

The size and morphology of the nanostructures were characterized by a Hitachi S-4800 field-emission scanning electron microscope (Tokyo, Japan). TEM measurements were conducted on a Hitachi-H800 transmission electron microscope (Tokyo, Japan) operating at 200 kV. HRTEM and ED were performed on a Tecnai G2 F20 FE-TEM (FEI, The Netherlands). The composition of the as-prepared sample grew on the copper was examined by X-ray power diffraction(XRD), performed using a DX-1000 powder X-ray diffractometer (Dandong Fangyuan Instrument Co., Dandong, China) with graphite monochromatized Cu Ka radiation (λ = 1.54178Å). The resistance of the copper foil during reaction was measured in situ with a FLUKE 8846A digital multimeter (Fluke, USA) using Pt wire counter electrode and Cu foil working electrode.

Preparation of $Cu(OH)_2$ and CuO nanoribbon arrays

Copper foils (4cm*1cm) were carefully polished with abrasive papers, then immersed into 4M HCl for 30s to remove the copper oxide, and washed with double distilled water several times, then quickly put into a 30 ml beakers with freshly prepared 10 ml 0.4M Na_2O_2 aqueous solution, and 10 ml $AgNO_3$ aqueous solution (0.6, 6, and 15mM respectively) was immediately poured into at ambient conditions without stirring. The copper foils were took out of the solution at 2min, 5 min, and 40min respectively, then washed with doubly distilled water several times and dried in air for further characterization. Under ultrasonication, CuO nanoribbon array on copper substrate was fabricated under the same experimental condition as $Cu(OH)_2$ nanoribbons.

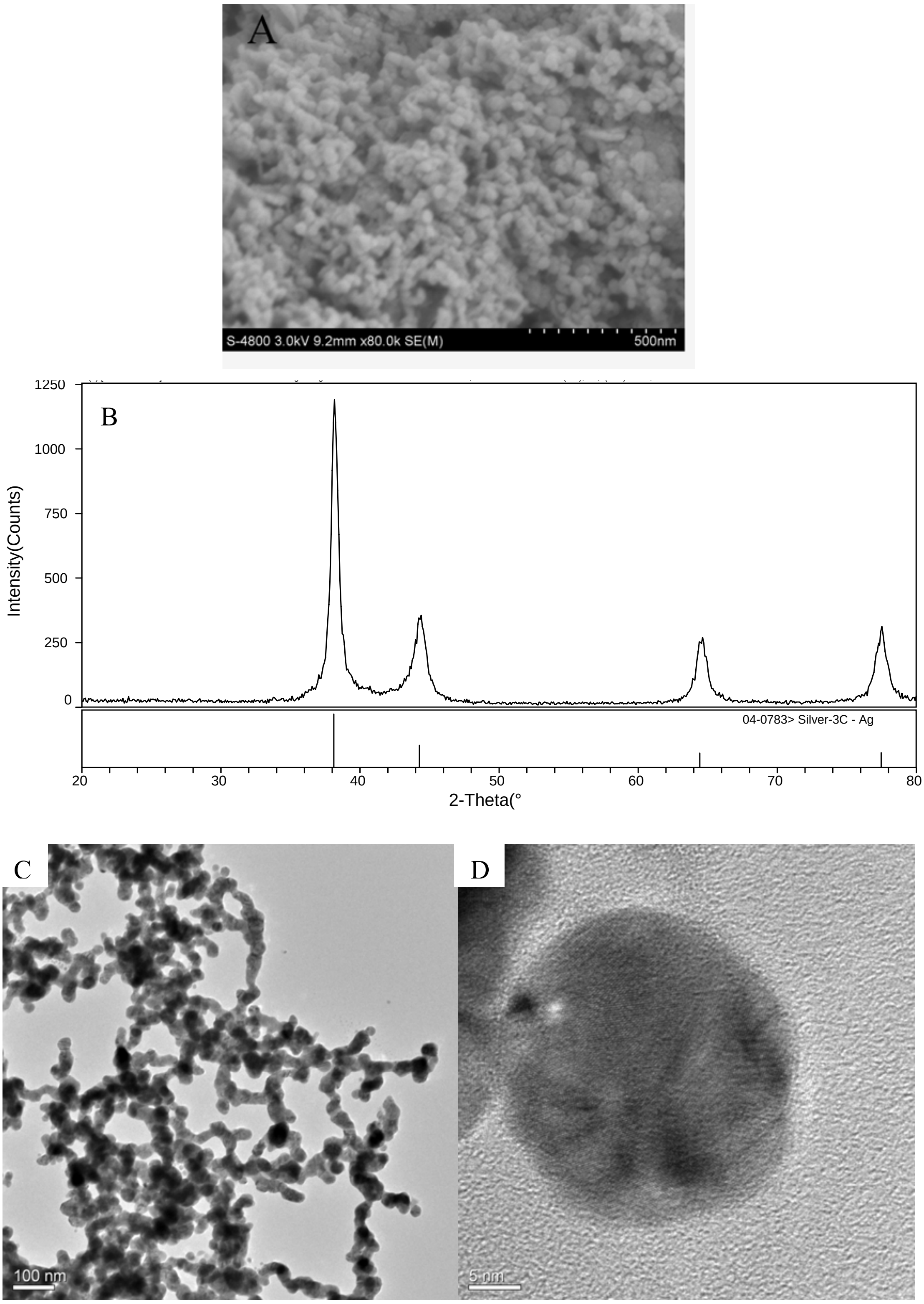

Fig. S1 (A) SEM image. (B) XRD pattern of the as-prepared Ag nanoparticles at a scan rate of 0.08°/sec of 2θ range from 20 to 80°. (C) TEM and (D) HRTEM images of the Ag nanoparticles from a mixture solution containing 0.2M Na_2O_2 and 3mM $AgNO_3$。

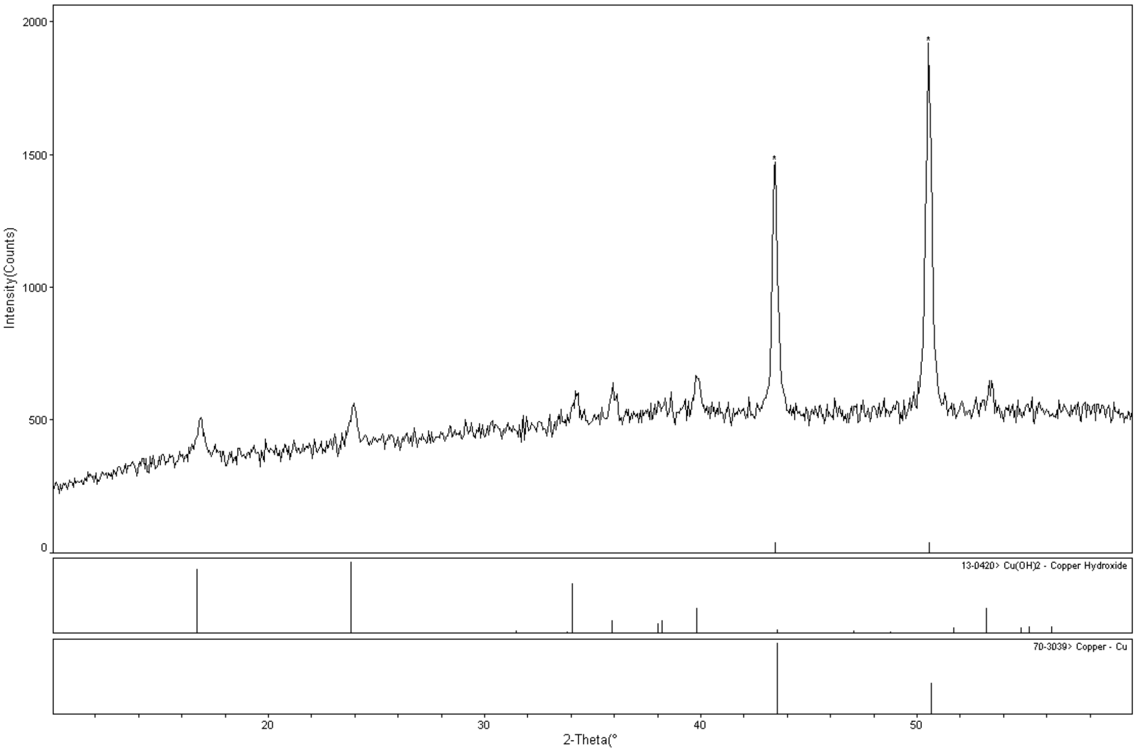

Fig. S2 The XRD pattern of the $Cu(OH)_2$ nanoribbons modified copper foil at a scan rate of 0.06°/sec of 2θ range from 10 to 70°.

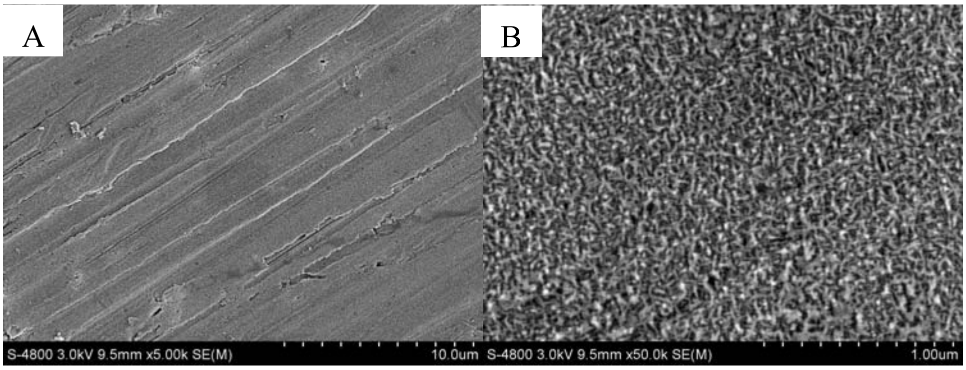

Fig. S3 (A) Low and (B) high magnification SEM images of the copper foil in 20ml 0.2M Na_2O_2 solution reacting for 6 hours without the addition of $AgNO_3$.

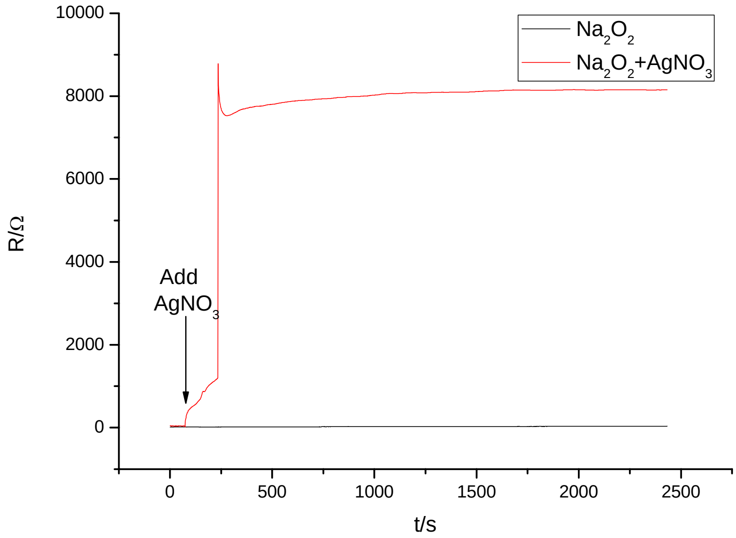

Fig. S4 The resistance of copper foil in the Na_2O_2 solution and the mixed solution containing $AgNO_3$ and Na_2O_2. The resistance of the copper foil in Na_2O_2 solution increased remarkably immidiately after the addition of $AgNO_3$ solution indicating the growing of the $Cu(OH)_2$ nanoribbons, and increaced dramtically after about 5 min due to the formation of uniform $Cu(OH)_2$ nanoribbon array. That's is to say, the eathcing of copper surface and the growth of the $Cu(OH)_2$ nanoribbons progressd in the presence of $AgNO_3$.

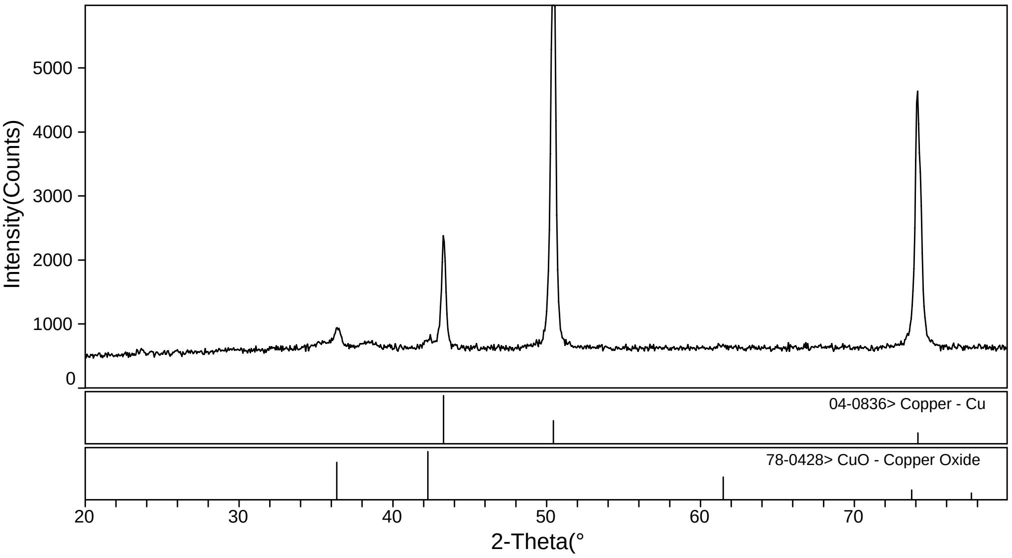

Fig. S5 XRD of CuO nanoribbon array fabricated in the mixture solution containing 0.2M Na_2O_2 and 3mM $AgNO_3$ under ultrasonic irradiation at a scan rate of 0.06°/sec for 2θ range from 20 to 80°.