Supporting Information for

Boosting photocatalytic performance for selective oxidation of biomass-derived pentoses and hexoses to lactic acid using hierarchically porous Cu/Cu_2O/CuO@CA

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Experimental section

1.1. Reagents

Cupric acetate monohydrate, hexadecyl trimethyl ammonium bromide, chitosan, acetic acid, formic acid, xylose, glucose, fructose, arabinose, mannose, and rhamnose are purchased from Aladin Industrial Corporation. Lactic acid, isopropanol, tryptophan, benzoquinone, and ethylenedianetetraacetic acid are obtained from Macklin Industrial Corporation (Shanghai, China). Potassium hydroxide, liquid nitrogen, and other reagents are provided by Dalian Chemical Reagent Factory, China. All chemicals were used directly without further purification.

1.2. Preparation of CuO NB

Firstly, 110.0 g of sodium hydroxide (NaOH) was gradually added into 900 mL of deionized water. Once the obtained NaOH solution cooled to room temperature, 20.0 g of hexadecyl trimethyl ammonium bromide (CTAB) was then slowly added into the solution under the stirring condition. After that, the obtained solution was heated to 60 ^{o}C from room temperature in the case of intense stirring to give NaOH-CTAB solution. Subsequently, 3.1 g of $Cu(NO_3)_2 \cdot 3H_2O$ was added into 100 mL of deionized water to form homogeneous solution, and then the obtained solution was gradually added into the NaOH-CTAB solution at 60 ^{o}C under the stirring conditions. The mixed system was stirred for 60 min. The mixed system was then filtered while hot, and the filter cake was washed with ethanol and deionized water for three times, respectively. The resulted black solids were dried overnight at 50 ^{o}C. Finally, the black powders were calcined at 350 ^{o}C for 120 min in the atmosphere of nitrogen to give CuO NB.

Results and discussion

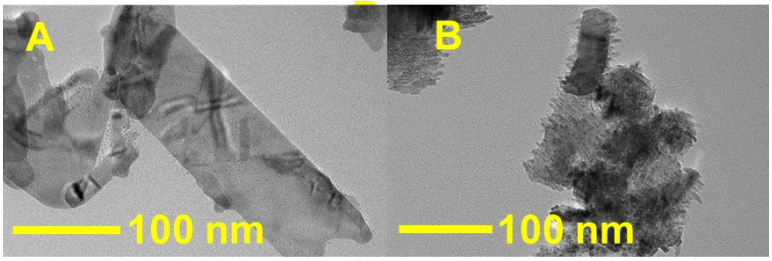

Fig. S1 TEM of CuO NB (A) and $Cu/Cu_2O/CuO$@CA (B).

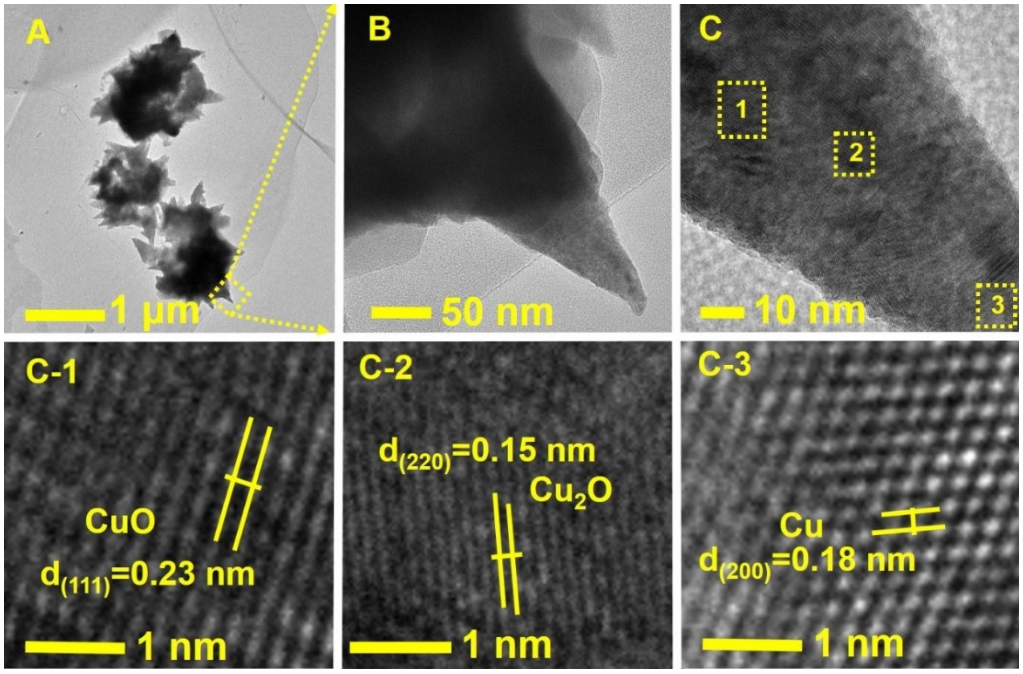

Fig. S2 TEM and HR-TEM of $Cu/Cu_2O/CuO$@CA.

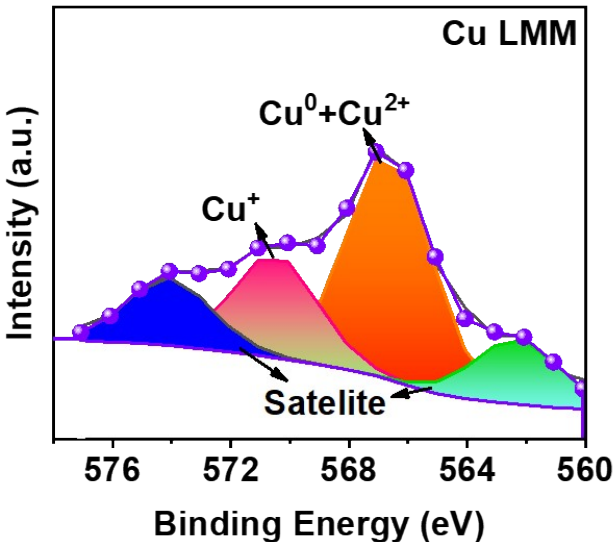

Fig. S3 The Auger Cu LMM spectra in $Cu/Cu_2O/CuO@CA$.

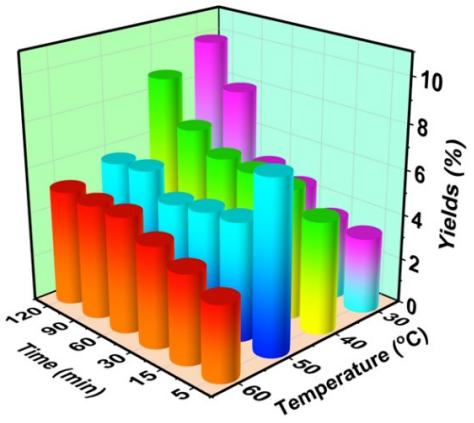

Fig. S4 Effects of reaction temperature and time on yields of formic acid.