

Electronic Supplementary Information (ESI)

Synthesis of Cu nanoparticles in mesoporous silica SBA-15 functionalized with carboxylic acid groups

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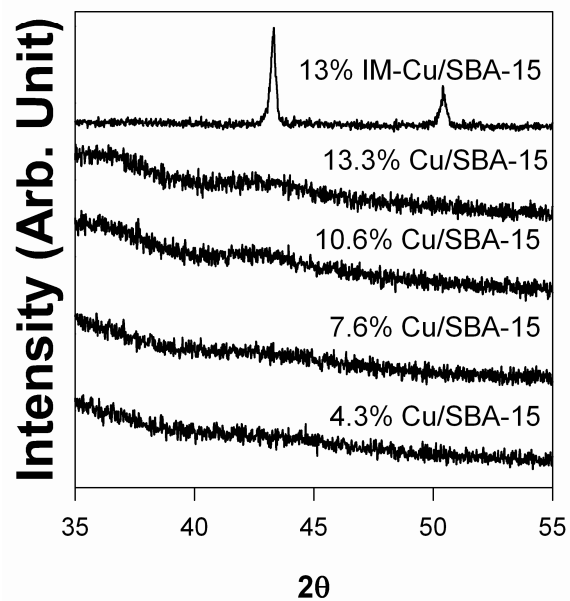


Fig. S1: The wide-angle XRD spectra of all Cu/SBA-15 and IM-Cu/SBA-15 catalysts.

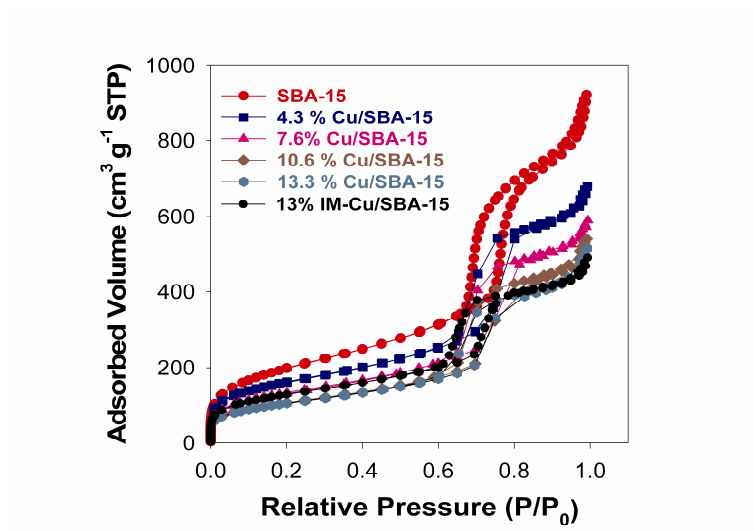


Fig. S2: The N₂ adsorption-desorption measurements of all pore structures of the mesoporous materials with and without Cu particles.

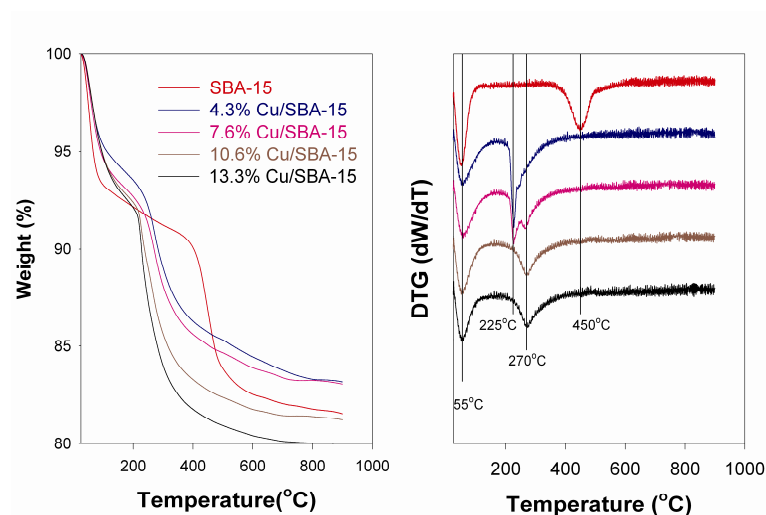


Fig. S3 the TGA and DTA curves of the –COOH functionalized SBA-15 template with and without Cu²⁺ ions in an air stream.

Thermal gravimetric analysis (TGA) was carried out on a Mettler Toledo, TGA/DSC 1 thermogravimetric analyzer with a heating rate of 10°C/min under air in a flow of 50 mL/min.

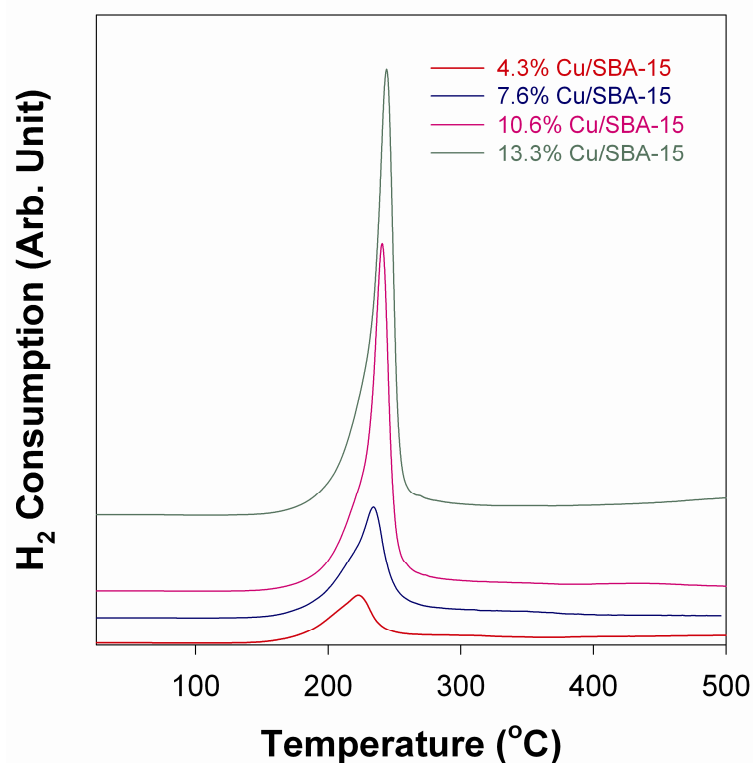


Fig. S4: The H₂-TPR profiles of the CuO/SBA-15 catalysts after calcination treatments.

H₂-TPR of catalysts was performed at atmospheric pressure in a conventional flow system. The as-prepared Cu²⁺/SBA-15 underwent calcination in air at 300°C for 5 h was placed in a tube reactor and heated in a 10% H₂/N₂ mixed gas stream flowing at 30 mL/min at a heating rate of 10°C/min. A cold trap containing a gel formed by adding liquid nitrogen to isopropanol in a Thermos flask was used to prevent water from entering the TCD.

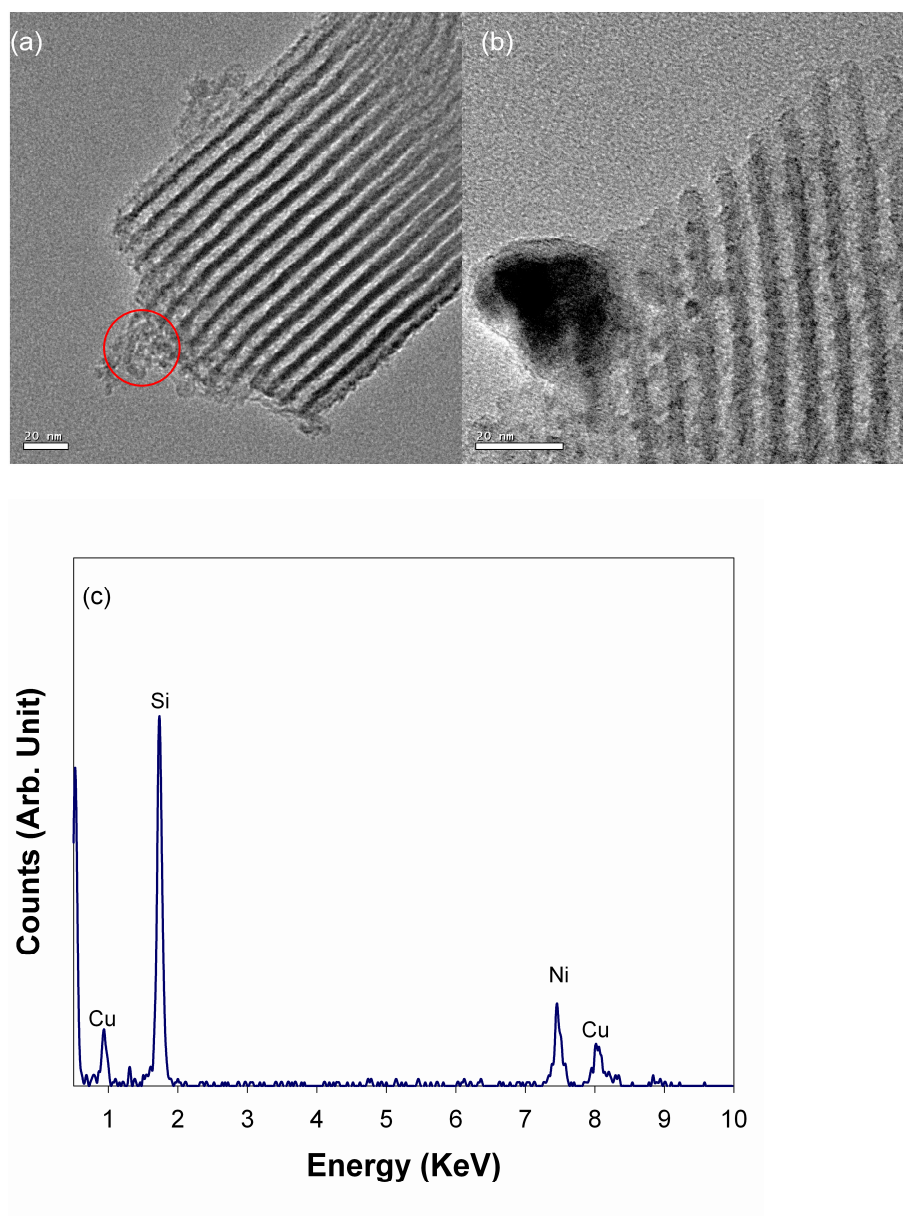


Fig. S5: (a) and (b) HRTEM of 13% IM-Cu/SBA-15; (c) EDX spectrum of the red circle in image (a).

High-resolution TEM analysis was carried out on a FEI Tecnai G2 F20 operating at 300 KeV. The catalyst samples after pretreatment were dispersed in methanol, and the solution was mixed ultrasonically at room temperature. A part of solution this solution was dropped on the nickel grid for the measurement of TEM images.