

Synthesis of highly ordered mesoporous CeO₂ and water-gas shift reaction over Cu_xCo_{3-x}O₄/mesoporous CeO₂ catalyst

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We report on the low water-gas shift (WGS, CO + H₂O → H₂ + CO₂) activity of Cu_xCo_{3-x}O₄ supported on highly ordered mesoporous ceria oxide with high surface area and a large pore volume. The preparation method was via a nano-replication method using a KIT-6 template to get highly ordered mesoporous CeO₂ support, then loading Cu_xCo_{3-x}O₄ on the meso-CeO₂ by an incipient wetness impregnation. The structure of the catalysts and the WGS reaction intermediate were characterized using powder X-ray diffraction (XRD), nitrogen sorption & adsorption isotherms, scanning electron microscopy (SEM), temperature programmed surface experiments. A 20 wt% Cu_xCo_{3-x}O₄/meso-CeO₂ catalyst displayed the highest catalytic activity among all the prepared catalysts. Beside high activity, the 20 wt% Cu_xCo_{3-x}O₄/meso-CeO₂ catalyst also exhibited the stability under WGS conditions compared to 20 wt% Cu_xCo_{3-x}O₄.