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Decreased CO production in methanol steam reforming over Cu/ZrO_2 catalysts prepared by the microemulsion technique

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Abstract

Production of hydrogen by methanol steam reforming has been studied over a series of Cu/ZrO_2 catalysts prepared by the microemulsion technique. Catalytic activity was compared to that of a commercial Cu/ZnO catalyst. The synthesized catalysts have been characterized and investigated with respect to methanol conversion, CO formation, and long term stability. Both TPR and XANES/EXAFS indicate that two different Cu species are present in the as-prepared samples. The materials have BET surface areas of up to 165 m^2/g. Characterization by XRD and TEM revealed that the Cu/ZrO_2 catalysts consist of tetragonal zirconia particles with a homogenous distribution of copper and zirconium in the material. Methanol steam reforming over these Cu/ZrO_2 materials results in substantially reduced CO formation at high methanol conversions compared to the commercial Cu/ZnO catalyst.

Keywords: Zirconium oxide; Microemulsion; In situ EXAFS; XPS; TPR; Methanol steam reforming; CO formation; Copper