Catalytic activity of copper oxide/zinc oxide composites prepared by thermolysis of crystallographically defined bimetallic coordination compounds

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Keywords: Heterogeneous Catalysis / Copper / Zinc / Thermochemistry / Structural chemistry

Abstract

The suitability of bimetallic coordination compounds in the systems Cu/Zn/CN and Cu/Zn/CN/ethylenediamine as precursors for CuO/ZnO was explored. The kinetic and thermodynamic equilibria in these systems are discussed. The introduction of ethylenediamine led to crystalline precursor compounds, and the bimetallic coordination compounds $[Zn(en)]_2[Cu_2(CN)_6]$ and $[Zn(en)_3]_6[Cu_2(CN)_7]_2[Cu(CN)_3]\cdot 8.4\ H_2O$ were structurally characterized. The oxide mixtures of CuO/ZnO, prepared by mild thermolysis of the precursor compounds, were tested for their catalytic activity in the formation of methanol from synthesis gas, i.e. $CO/CO_2/H_2$. While the oxide mixtures from $Zn[Cu(CN)_3]$ were not catalytically active, the oxide mixtures derived from the crystalline compounds with ethylenediamine as ligand had about 20-30 % of the activity of an industrial methanol catalyst. This underscores the importance of the origin of the catalyst, i.e. the dependence of its activity from the structure of its precursor.