A Straightforward Route to Copper/Zinc Oxide Nanocomposites: The Controlled Thermolysis of $Zn[Cu(CN)_3]$

Yanzhi Guo,[a] Rainer Weiss,[a] and Matthias Epple*[a]

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Copper–zinc nanocomposites were prepared by thermolysis of copper–zinc cyanides under mild conditions. Two different routes were used for the preparation of the cyanide complex: A batch precipitation method and the continuous overflow precipitation method. The thermolysis of the cyanides was studied in-situ by thermogravimetry coupled with infrared spectroscopy (TG-IR) and by thermogravimetry coupled with mass spectroscopy (TG-MS). The structure of the nanocomposites was investigated by X-ray powder diffraction (XRD) and extended X-ray absorption fine structure (EXAFS). Geometric models were suggested on the atomic scale based on EXAFS results for the precursor, the mixed oxides (CuO/ZnO), and the reduced copper–zinc samples (Cu/ZnO, i.e. catalyst for methanol synthesis). In the batch precipitation method, the influence of temperature on the morphology of the thermolysis products was explored. In the continuous overflow method, the morphology of the Cu–Zn cyanide complex was investigated as a function of concentration and residence time. A high solution concentration and a short residence time (equivalent to a high flow rate) led to smaller particles.