

STM Study of Nano-Sized ZnO on Cu(111)

D. Bikaljevic, R. Rameshan, N. Köpfle, B. Klötzer and N. Memmel

Institute of Physical Chemistry, University of Innsbruck, Austria
djuro.bikaljevic@uibk.ac.at

The Cu/ZnO_x system is widely used as an active catalyst for several reactions as methanol synthesis, methanol steam reforming or water gas shift reaction. For CO oxidation we find that ≈ 1.5 ML Zn, oxidized at 430 K on a polycrystalline Cu foil, catalyse the reaction towards CO₂ at relatively low temperatures (485 K). In order to reveal possible active sites, STM investigations of nano-sized ZnO were carried out in ultra-high vacuum on a Cu(111) single crystal (Fig. 1). The STM data strongly suggest that the interface between ZnO and Cu plays a crucial role. The first monolayer of Zn – passivating the Cu substrate – is nearly unaffected by the oxidation process at 430 K. However, at reaction temperature (485 K), the first closed Zn layer partially desorbs, enabling formation of a ZnO/Cu interface, catalysing the reaction and leading to a quasi-autocatalytic increase in CO₂ formation rate.

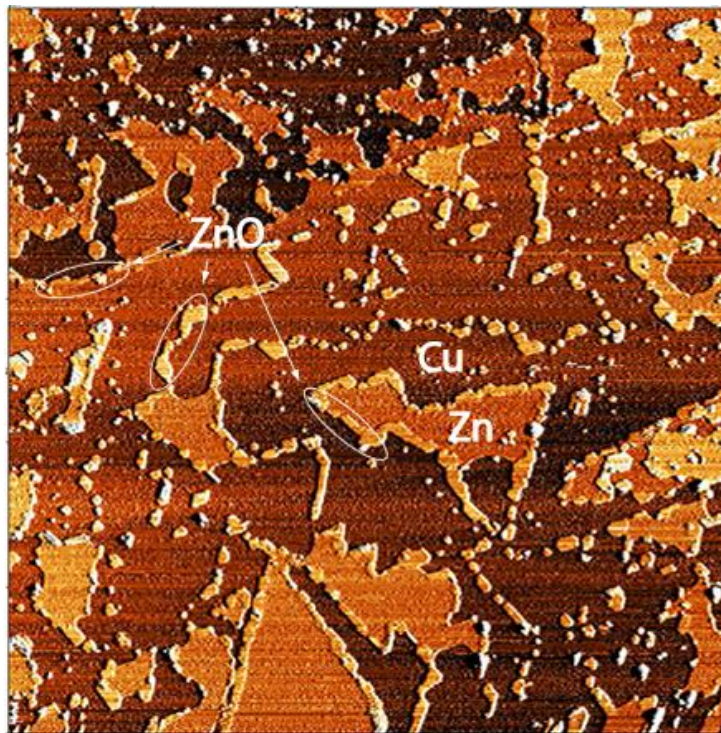


Fig. 1 STM image of an oxidized Zn-film on Cu(111), annealed to temperatures beyond 485 K.
Image size: 650 x 650 nm²