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Morphology and growth behavior of Cu nanoparticles on the vicinal ZnO(10-14) surface

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The ZnO(10-14) surface raised recent scientific interest for its outstanding stability despite its high indexed orientation, which results in a stepped mixed-terminated surface.[1] In this study, copper nanoparticles were grown via physical vapor deposition onto a ZnO(10-14) single crystalline surface and the structure and morphology was investigated using low energy electron diffraction, high energy grazing incidence x-ray diffraction, scanning electron microscopy and scanning tunneling microscopy.

Caused by anisotropic diffusion, elongated Cu particles are formed parallel to the surface steps of the substrate. They show a unique tilt of their (111) planes parallel to the (0001) terraces of the vicinal surface. This causes the generation of large, high indexed Cu facets in which their atomic steps could act as reaction sites in catalytic reactions such as methanol synthesis and CO2 activation.

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