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Titel des Beitrags: Platinum Nanoparticles on Gallium Nitride Surfaces: Effect of Semiconductor Doping on Nanoparticle Reactivity

Abstract: Platinum nanoparticles supported on n- and p-type gallium nitride (GaN) are investigated as novel hybrid systems for the electronic control of catalytic activity via electronic interactions with the semiconductor support. In situ oxidation and reduction were studied with high pressure photoemission spectroscopy. The experiments revealed that the underlying wide-band-gap semiconductor has a large influence on the chemical composition and oxygen affinity of supported nanoparticles under X-ray irradiation. For as-deposited Pt cuboctahedra supported on n-type GaN, a higher fraction of oxidized surface atoms was observed compared to cuboctahedral particles supported on p-type GaN. Under an oxygen atmosphere, immediate oxidation was recorded for nanoparticles on n-type GaN, whereas little oxidation was observed for nanoparticles on p-type GaN. Together, these results indicate that changes in the Pt chemical state under X-ray irradiation depend on the type of GaN doping. The strong interaction between the nanoparticles and the support is consistent with charge transfer of X-ray photogenerated free carriers at the semiconductor-nanoparticle interface and suggests that GaN is a promising wide-band-gap support material for
photocatalysis and electronic control of catalysis.

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