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3307 Nielsen Physics Bldg. at UT
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Nanostructured Materials for Energy Conversion

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Abstract:

Nanostructured materials hold great promise in achieving efficient solar energy conversion. Among these materials, we specifically focus our research on the metal oxides for photon-electron conversion and chalcogenides for solar thermal-electron conversions. The major challenge for metal oxide nanoparticle photocatalysts is their intrinsic wide band gap, which prevent them from utilizing solar energy efficiently. In order to enhance the visible light sensitivity of metal oxides nanoparticles, we developed a solution based chemical route to incorporate N into group IVB metal oxide (TiO2, ZrO2 and HfO2) nanoparticles. The core-level XPS and VB-XPS study indicate that the N was successfully doped into the metal oxide nanoparticles and significantly change the electronic structures of valence band. The reflectance and difference reflectance spectra suggested that the doping induced visible light absorption mainly caused by oxygen defects. The photo decomposition of methlyene blue test shows that the photocatalytic performances of these N-doped nanoparticles were greatly enhanced comparing to undoped TiO2 nanoparticles in the visible light region.