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Photovoltaic Properties of TiO2/Cu2O Heterostructure DONGDONG LI, PAI-CHUN CHANG, SHENG CHU, C.J. CHIEN, JIA G. LU, Univ of Southern California — TiO_2 is an n-type semiconductor with a wide band gap energy of 3.2 eV. It has been known for its photo catalytic effect and widely used in commercial products. Particularly in the growing photovoltaic industry, dye-sensitized solar cells (DSC) made by TiO_2 nanotube electrode have demonstrated to have conversion efficiency up to 6.9 %. However, the TiO_2 nanotube based DSC is humbled by the nature of its electrolyte environment. Hence, an all solid-state core shell $p-n$ junction utilizing the TiO_2 nanostructure solar cell is of great potential to provide another solution for the rising photovoltaic industry. In order to fabricate heterostructures, cuprous oxide (Cu_2O), a p-type semiconductor with a direct band gap of 2.0 eV, is a promising candidate to form $p-n$ heterojunction with TiO_2. Here we present a method to achieve Cu_2O/TiO_2 $p-n$ junction through electrochemical approaches. A self-doping method is addressed on crystallized TiO_2 nanotubes to further improve the contact and device performance. The photovoltaic property of Cu_2O/TiO_2 hetero-structure is measured, giving an open circuit voltage $\sim$0.25 V, a short circuit current $\sim$0.33mA/cm^2, and filling factor $\sim$27%. Although the efficiency is still low, it demonstrates promising potential to achieve low cost flexible photovoltaic device.

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