Electrochemical Grafting of Poly(3,4-ethylenedioxythiophene) into a Titanium Dioxide Nanotube Host Network

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This study focuses on electrodeposition for infiltrating in situ a conducting polymer such as poly(3,4-ethylenedioxythiophene) (PEDOT) into a host titanium dioxide (TiO_2) nanotube array (NTA) framework. The TiO_2 NTA was electrosynthesized on titanium foil in turn by anodization in a fluoride-containing medium. The PEDOT layer was electrografted into the TiO_2 NTA framework using a two-step potentiostatic growth protocol in acetonitrile containing supporting electrolyte. The nanoscopic features of oligomer/polymer infiltration and deposition in the NTA interstitial voids were monitored by field-emission scanning electron microscopy. Systematic changes in the nanotube inner diameter and the wall thickness afforded insights into the evolution of the TiO_2NTA/PEDOT hybrid assembly. This assembly was subsequently characterized by UV−visible diffuse reflectance, cyclic voltammetry, and photoelectrochemical measurements. These data serve as a prelude to further use of these hybrids in heterojunction solar cells.