Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Optoelectronic Properties of Hybrid Titania Nanotubes/Hematite Nanoparticles Structures LILI WANG, EUGEN PANAITESCU, LATIKA MENON, Northeastern University — TiO_2/Fe_2O_3 nanostructures are becoming promising alternatives for improving cost effectiveness (in \$/W) of emerging photovoltaic devices such as dye sensitized or metal-insulator-semiconductor solar cells, combining the low cost, earth abundance and stability of the materials with the enhanced performance offered by the nanoscale architecture. We investigated novel, high quality titania/hematite composites, namely hematite nanoparticle decorated titania nanotube arrays, which were obtained by a simple, inexpensive and easily scalable two-step process, electrochemical anodization of titanium followed by forced hydrolysis. The titania nanotubular scaffold provides a large active surface area, while the iron oxide nanoparticles significantly broaden the light absorption range into the visible region. The morphological and structural characteristics of the samples were analyzed by scanning electron microscopy (SEM), X-ray diffraction (XRD) and transmission electron microscopy (TEM). The light absorption efficiency was measured by diffuse reflectance spectroscopy (DRS), and the optoelectronic behavior of the hybrid structures was analyzed by IV measurements under simulated solar illumination. The influence of the synthesis process and the structure design on the photovoltaic performance is currently investigated for optimal device prototyping.

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Date submitted: 14 Nov 2014 Electronic form version 1.4