Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Carrier mobility enhancement of nano-crystalline semiconductor films: Incorporation of redox -relay species into the grain boundary interface L. A. DESILVA, University of West Georgia, T.M.W.J. BANDARA, Rajarata University, B.H. HETTIARACHCHI, G.R.A. KUMARA, University of Peradeniya, A.G.U. PERERA, Georgia State University, R.M.G. RAJAPAKSA, University of Peradeniya, K. TENNAKONE, Georgia State University — Dye-sensitized and perovskite solar cells and other nanostructured heterojunction electronic devices require securing intimate electronic contact between nanostructured surfaces. Generally, the strategy is solution phase coating of a hole -collector over a nano-crystalline high-band gap n-type oxide semiconductor film painted with a thin layer of the light harvesting material. The nano-crystallites of the hole – collector fills the pores of the painted oxide surface. Most ills of these devices are associated with imperfect contact and high resistance of the hole conducting layer constituted of nano-crystallites. Denaturing of the delicate light harvesting material forbid sintering at elevated temperatures to reduce the grain boundary resistance. It is found that the interfacial and grain boundary resistance can be significantly reduced via incorporation of redox species into the interfaces to form ultra-thin layers. Suitable redox moieties, preferably bonded to the surface, act as electron transfer relays greatly reducing the film resistance offerring a promising method of enhancing the effective hole mobility of nano-crystalline hole-collectors and developing hole conductor paints for application in nanostructured devices.

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Date submitted: 13 Nov 2016 Electronic form version 1.4