

Abstract Submitted
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Enhanced Photovoltaic Effect from Nanocomposite of Treated PbS quantum dots and π -conjugated polymers XIAOMEI JIANG, JIAN ZHANG, University of South Florida — We report novel type of hybrid solar cells based on nanocomposites of conjugated polymers (polythiophene) and IR-sensitive PbS nanocrystals that have a size-tunable energy gap between ca. 0.7 and 1.6 eV. Thin film cells show very good diode characteristics and sizable photovoltaic response. The good performance of our devices in both photovoltaic and photodiode regimes indicates quite efficient charge separation between the polymer and QD components. To further facilitate charge separation and transport in these composite structures, we applied various ligands exchange (pyridine, butylamine and octylamine) to the quantum dots prior to device fabrication. We find noticeable increase of photocurrent due to more efficient charge separation when the original bulky oleic acid ligand of the nanocrystals was replaced by these much smaller ligands. We have conducted mobility measurement of PbS QDs with different sizes, both in pure QD film and the hybrid nanocomposite with polymers. Both electronic and optical device characterizations were carried out. Specifically, we observe indications of a rapid increase in the photocurrent at spectral energies in correlation with the size-dependent energy gap of the QD component.

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