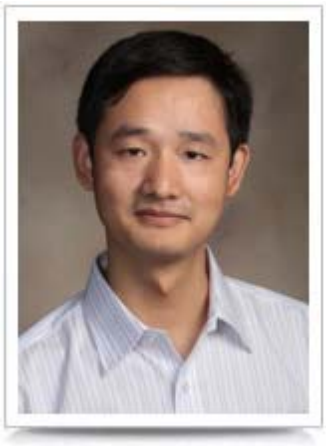

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Developing Efficient Pyrite Photovoltaic Cells

Abstract.

The development of affordable solar cells is one of the most promising energy solutions. A solar cell module priced at $0.5/Watt would unlock the potential of the sun to provide low-cost, clean limitless electricity to the U.S. and the rest of the world, at the same cost of coal-based generation. In this project we proposal to develop pyrite based solar cells which potentially can reach the low cost objective of $0.5/Watt due to these features: natural abundance and nontoxic pyrite material, low-temperature solution processing to fabricate solar cells, and low cost large scale fabrication process. The research goal of this project is to investigate the synthesis and processing of pyrite nanocrystals (NCs), and develop the device engineering to achieve high efficiency (>5%) pyrite solar cells. The main two technical barriers that limit the efficiency of pyrite solar cell will be addressed: the absence of methodologies to produce phase-pure, low-cost solar grade pyrite film, and the presence of a high concentration of interfacial states in pyrite films. Based on the PIs' successful demonstration of the synthesis of phase-pure, air stable, highly crystalline iron pyrite NCs using a surfactant assisted hot-injection method, the PIs will continue to study the function of ligand wrapping in stabilizing the pyrite NC surface to provide guidance for pyrite surface passivation, use core-shell structure to passivate the NCs, and apply a depleted junction device structure to increase the efficiency.