Solution Processed Semiconductors for Energy and Environment

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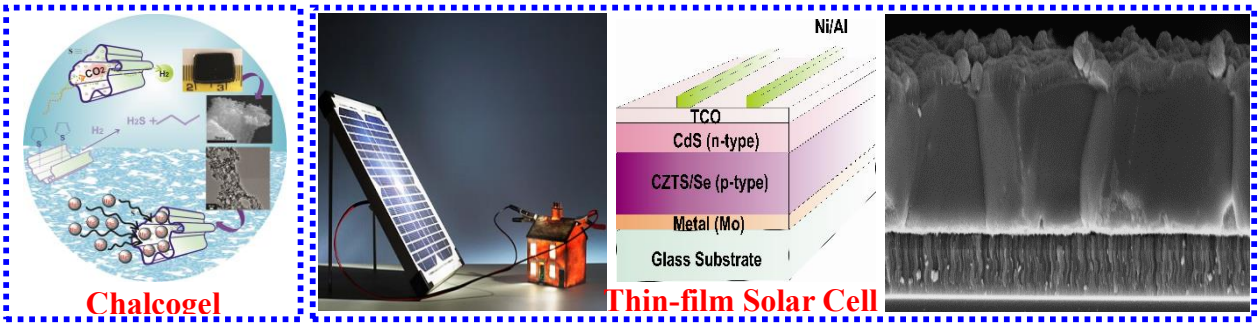
Abstract

Solution processed semiconductors are attractive candidates for many technological applications due to their reduced manufacturing costs, low temperature processing and improved uniformity over larger area. Here two main approaches (solution-particle and sol-gel) for solution processing semiconducting materials, particularly chalcogenide (the column of elements on the periodic table beginning with but not including oxygen) based semiconductors will be discussed and their applications in fabricating thin-film solar cells and creating porous semiconductors will be summarized. Thin-film copper-zinc-tin-sulfur/selenium based $Cu_2ZnSn(S_xSe_{1-x})_4$ (CZTSSe) absorber materials are potential candidates for unlimited growth of chalcogenide photovoltaic production beyond 100GWp/year due to their reduced content of heavy metals, low cost and readily available constituents. In the first half of my talk, I will discuss development of >10% efficiency CZTSSe solar cells based on solution-particle approach. In another project, nanoporous semiconductors are made using a simple metathesis reaction and sol-gel method. These novel class of materials possess interesting adsorption properties and show promise towards removing heavy metals from water and separating CO_2 over H_2. Additionally, these materials act as efficient hydrodesulfurization and solar fuel catalysts. In the second half of my talk, an overview of the semiconducting nanoporous project will be presented.



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