Journal of Solar Energy

Hindawi

Special Issue on **Thin Film Photovoltaics**

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Global environmental concerns and the escalating demand for energy, coupled with steady progress in renewable energy technologies, are opening up new opportunities for utilization of renewable energy resources. Solar energy is the most abundant, inexhaustible, and clean of all the renewable energy resources till date. The power from sun intercepted by the earth is about 1.8×10^{11} MW, which is many times larger than the present rate of all the energy consumption. Photovoltaic technology is one of the finest ways to harness the solar power.

Silicon technology has been the dominant one for the supply of power modules into photovoltaic applications and the likely changes are an increasing proportion of multicrystalline silicon and monocrystalline silicon being used for high-efficiency solar cells while thinner wafers and ribbon silicon technology continue to grow.

Amorphous silicon is the most popular thin film technology with cell efficiencies of 5–7% and double- and triple-junction designs raising it to 8–10%. But it is prone to degradation. Crystalline silicon offers an improved efficiency when compared to amorphous silicon while still using only a small amount of material. The commercially available multicrystalline silicon solar cells have efficiency around 14–19%.

There is a special interest in thin film solar cell these days. Thin films greatly reduce the amount of semiconductor material required for each cell when compared to silicon wafers and hence lowers the cost of production of photovoltaic cells. Cadmium telluride (CdTe) and Copper indium gallium diselenide ($CuIn_{1-x}Ga_xSe_2$) are materials that have been mostly used for thin film PV.

The semiconducting compound (CZTS) is made up of earth-abundant, low-cost, and nontoxic elements, which make it an ideal candidate to replace $Cu(In,Ga)Se_2$ (CIGS) and CdTe solar cells which face material scarcity and toxicity issues. The device performance of CZTS-based thin film solar cells has been steadily improving over the past 20 years, and they have now reached near commercial efficiency levels (10%). These achievements prove that CZTS-based solar cells have the potential to be used for large-scale deployment of photovoltaics.

The breakthrough discovery of organometal halide perovskite materials as a superior converter to transform solar energy into electrical energy has completely changed the photovoltaic competition in the third-generation solar cells. Solar cell efficiencies of devices using perovskite materials have increased from 3.8% in 2009 to 22.1% in early 2016, making this the fastest-advancing solar technology to date with the potential of achieving even higher efficiencies and the very low production costs, perovskite solar cells have become commercially attractive, with start-up companies already promising modules on the market by 2017; therefore, special attention has been given in this issue.

Potential topics include but are not limited to the following:

- Thin film Si based PV
- Perovskite solar cells
- Organic based PV (polymer PV, DSSC, and hybrid approach)
- Thin film polycrystalline PV (CIGS, CZTS, CdTe, and SnS)
- Plasmonics and nanostructured PV

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Manuscript Due
Friday, 20 January 2017

First Round of Reviews
Friday, 14 April 2017

Publication Date
Friday, 9 June 2017