Perovskite Solar Cells

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Solar energy has been widely used in human history. Nowadays, with the discovery of the photoelectric effect and the rising of modern physics, light was recognized as photons, which directed the way to another application: converting solar energy into electricity. From then on, solar energy was thought of as the promising renewable candidate to replace the non-renewable fossil energy.

Solar cell is a key device that converts the light energy into the electrical energy in photovoltaic energy conversion. The energy conversion consists of absorption of light (photon) energy producing electron–hole pairs in a semiconductor and charge carrier separation. A p–n junction is used for charge carrier separation in most cases.[1]

A type of photovoltaic is Perovskite solar cell. The Perovskite crystal structure, $A^{I}M^{II}X^{-I}{}_{3}$, is characterized by $[MX_6]^{4-}$ octahedral, which share corners in all three orthogonal directions to generate infinite three dimensional $[MX_3]^{-}$ frameworks. The X symbolizes the group of halides (Cl, Br, I). The M symbolizes the group of metals (Ge^{2+}, Sn^{2+}, Pb^{2+}) and the A is specific cations (Cs^{+}, $CH_3NH_3^{+}$ (MA), $HC(NH_2)_2^{+}$ (FA)). [2]
The direct band gap, large absorption coefficient and high carrier mobility of perovskites render them very attractive for use as light harvesters in heterojunction solar cells.[3] Perovskite solar cells have improved a lot in the last decade and their efficiency is better than other classic solar cells. However they can be further improved.

In this project, I will present the function of solar cells and I will focus on Perovskite solar cells and certain applications found from bibliography.

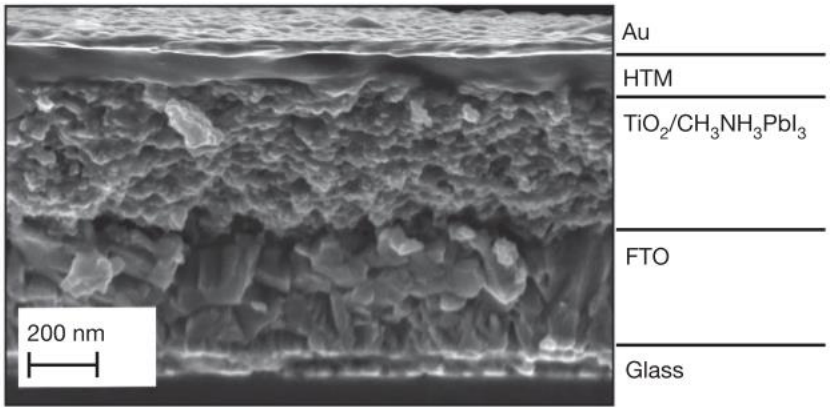

Figure 1:Cross-sectional SEM of a Perovskite solar cell.[4]

References

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