New Insights into Organic-Inorganic Lead Halide Perovskites Solar Cells

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In a short period of time conversion efficiency of solution-processed organic-inorganic lead halide based perovskite solar cells has soared from 3.6% in a liquid junction to over 15% for a solid state cell. However, although some mechanisms were suggested and speculated in the literature, the exact working principle of these cells is still unclear. Two different systems were reported to give over 15% power conversion efficiency one with mehylammonium lead iodide and the other with methylammonium lead iodide chloride. In both the absorber was placed between two selective contacts. However, while methylammonium lead iodide have used mesoporous-sensitized designs, methylammonium lead iodide chloride used either an electronically inert geometric scaffold or a polycrystalline thin-film designs. Most impressive, both types of perovskite cells exhibit high V_{OC} values reaching V_{OC}/E_{Gap} values of up to 0.71, a remarkably high figure for polycrystalline based cell. Here the fundamental question of how these cells work and what are the differences between the two systems are addressed by applying a scanning electron microscopy (SEM)-based technique to cell cross sections alongside with other spectroscopic methods.