Nanomaterials for Emerging Photovoltaics: Halide Perovskite Solar Cells

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Abstract

Halide perovskite solar cells (PSCs) have revolutionized the photovoltaic arena providing power conversion efficiencies currently above 25 %, low cost and ease of fabrication. Their low-weight, semi-transparency and flexibility make them ideal energy sources for applications in self-powered devices required for the future internet of things (IoT). Their combination in tandem architectures with Silicon solar cells will permit building a terawatt-scale energy production required for low-carbon economy, shaping the energy future of our society. In this talk we will present our most recent development related to the synthesis and application of nanostructured materials applied in perovskite solar cell as transport layers and as absorbers. We will demonstrate the importance of the use of organic additives for the passivation of defects increasing devices efficiency and lifetime. We will also show how nanomaterials can be synthesized at low temperature to be compatible with the printing processing methodologies required for the fabrication of printed solar cells. We will show the fabrication of highly stable and highly efficient PSCs that can last more than 1000 h under continuous irradiation retaining their initial efficiency of 21 %. We will also show the application of semiconductor oxides as transport layers in PSC (Figure 1).

References

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Figures

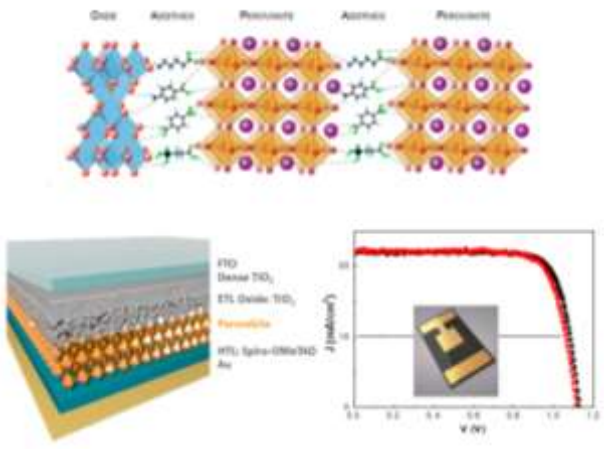

Figure 1: Halide perovskite solar cells. Interaction between transport layers such as oxides, the halide perovskite and different organic additives (top). Schematic representation of a Perovskite solar cell (bottom left) and an IV curve and an image of a device analysed under 1 sun (bottom right).