

The impact of two-dimensional materials in perovskite photovoltaics: from lab cells to solar farm

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Two-dimensional (2D) material is playing an important role in perovskite photovoltaics. Halide perovskite and 2D materials, including 2D perovskites, can be combined to enhance efficiency and stability of solar cells. In this talk I will present the progresses made in the use of 2D materials such as Graphene, MoS₂ and MXenes to improve the performance and the stability of perovskite solar cells. With a thorough multiscale experimental investigation, we point out that 2D materials can tune interfaces properties, reduce ion migration, and modify the work-function of the perovskite absorber and charge transporting layers, all aspects that directly impact on the final efficiency and the stability under accelerated stress tests. This approach has been also extended to the realization of a stand-alone solar farm with 9 panels (0.5 sqm each) obtained with single junction graphene-perovskite sub-modules with efficiency up to 16% (on a substrate area of more than 100cm²) and panel efficiency exceeding 10%.