Graphene-Perovskite photovoltaics: from lab cells to panels

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Abstract

Two-dimensional (2D) material such as graphene and related materials have been recently considered for photovoltaic applications. In particular, 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 Graphene and other related 2D materials (GRM) such as MoS2 and MXenes to improve the performance and the stability of perovskite solar cells. The use of 2D materials allowed us to reach more than 26% efficiency in a tandem graphene-perovskite/silicon cell and permitted to realize a solar farm with 0.5 sqm panels 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%. With a thorough multiscale experimental investigation, we point out that GRM 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.

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