Graphene and Perovskite: how GO alkaline doped 2D materials can boost the efficiency and stability of Perovskite Solar Cells using an upscaling route

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In the last decade, perovskite solar cells (PSCs) have shown great potentialities in developing low cost, flexible, lightweight and high-throughput new generation photovoltaic technology. Many factors can affect the PSCs efficiency and stability and nowadays several strategies have been proposed to improve the perovskite layer morphology and to optimize the perovskite/charge transporting layer interfaces. Indeed, among the several formulation proposed till now for perovskite precursor solution, double cation perovskite, comprising cesium and formamidimium as cations and lead iodide/bromide as halogen precursors demonstrated superior photochemical stability, providing a viable route for the device scaling-up from lab-scale device to large area module[1]. As a matter of fact, interfaces can influence layers deposition, charge recombination and compound intermixing/diffusion, representing a critical aspect for the technology scaling up: in this perspective, graphene oxide (GO) has shown a great potential for interface engineering and various others applications such as separation membranes, catalysis, energy storage, biomedicine, and composites [2]. In this work, GO alkaline doped 2D materials, such as Rb and K doped GO, have been included in a mesoscopic structure employing double cation perovskite. The perovskite deposition has been performed by double step deposition technique (without the use of an antisolvent step), aiming to facilitate the technology upscaling. Moreover, we demonstrated the use of graphene derivatives materials can be an effective way in controlling the perovskite morphology [3] by improving eventually both device stability and efficiency [4,5]. The combination of graphene derivatives with double cation perovskite deposition, suitable for large-scale deposition techniques such as blade or slot-die, could really pave the way towards the commercialization of Perovskite Solar Technology.

References

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