

SELF-ASSEMBLED GRAPHENE DERIVATIVES USED AS HTLs FOR HIGHLY EFFICIENT INVERTED PEROVSKITE SOLAR CELLS

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The performance of inverted perovskite solar cells (PSCs) based on graphene oxide hole transporting materials is still unsatisfactory due to the high degree of surface oxygen contents and the insulating property. In this study, thickness-controlled and full-coverage graphene oxide films prepared by layer-by-layer self-assembly technique are firstly developed as hole transporting layers (HTLs) in PSCs. Meanwhile, conductivity tunable reduced graphene oxide films are *in-situ* prepared by an environment-friendly and efficient reductant system. A superior PCE of 16.28% based on rGO as prepared is obtained, resulting in an increment by approximately 33% compared with 12.26% of the device based on GO-1 as mentioned. At the same time, this work reveals an anomalous charge-extraction behavior of PSCs based on GO or rGO HTLs. Competition effect of interfacial recombination, charge transportation and radiation recombination in this process are proposed to analyze the internal mechanisms. This work provides a facile and novel method to prepare GO or rGO films, which can be used as efficient charge-extraction layers and even electrodes in inverted PSCs.

Reference: Yin, X.; Zhou, Y.; Han, J.; Nan, H.; Tai, M.; Gu, Y.; Li, J.; Lin, H.*, Highly efficient inverted perovskite solar cells based on self-assembled graphene derivatives. *Journal of Materials Chemistry A*, 2018, 6, 20702-20711.

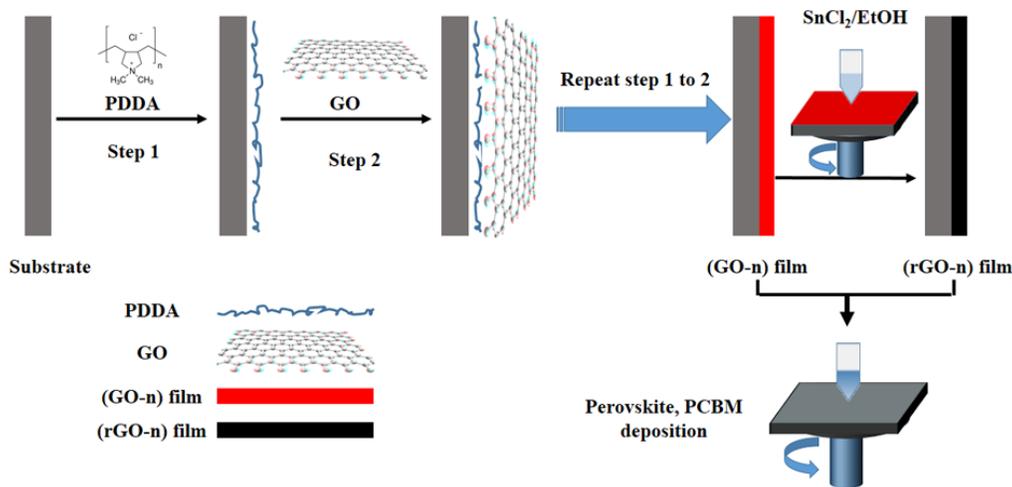


Figure 1 –Procedures to prepare thickness-controlled GO and conductivity tunable rGO films used as HTMs in PSCs.