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Graphene quantum dots as interface materials for organic photovoltaic cells

Organic photovoltaic cells (OPVs) represent an exciting class of renewable energy technology, and are under intensive investigation in both academic institutions and industrial companies due to their potential to enable mass production of flexible and cost-effective devices through roll-to-roll techniques. The proper choice of interface materials is a must for highly efficient and stable OPV devices and has become a significant part of the OPV research today. Interface materials are either non-conducting, semiconducting or conducting layers which not only provide selective contacts for carriers of one sort, but can also determine the polarity of OPV devices, affect the open-circuit voltage, and act as optical spacers or protective layers.

Owing to their unique two-dimensional structure, and functionalization-induced tunable electronic structures, graphene and its derivatives have been used as a new class of efficient interface materials in OPVs. Highly efficient and stable OPVs have been fabricated with graphene and its derivatives as interface materials. After a brief introduction of OPVs, the progress in interface materials and interface engineering at the both anode and cathode in OPVs and PSCs in my group will be introduced. At anode interface, the work function of graphen oxide (GO) is improved by O_2 plasma treatment or photochemical chlorination. Due to high transparence and high work function of GO derivatives, the power conversion efficiency of OPVs was improved significantly when the GO derivatives with higher work function was used as anode interfacial materials.

Acknowledgement: This research was financially supported by the National Natural Science Foundation of China (61564003), and the Guangxi Natural Science Foundation (2015GXNSFGA139002), and the Guangxi Bagui Scholar program.

References

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Figures

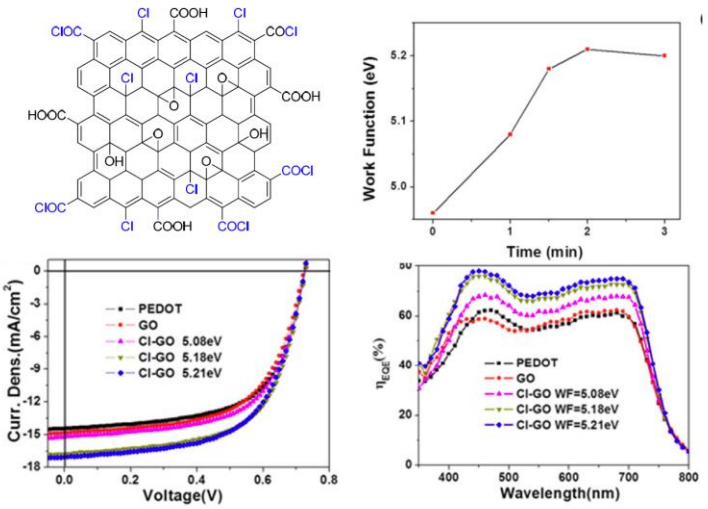

Figure 1: Chlorinated GO and the performance of organic solar cells