Modified and Reduced Graphene Oxide: Opportunities for New Applications

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Graphene and its functional derivatives (GO and rGO) have, since their synthesis, found a broad range of possible applications due to their remarkable chemical and physical properties.[1] Particularly, graphene oxide, an oxidized graphite sheet containing oxygen functionalities on the basal plane and on the edges, offers a unique opportunity to change the chemical and physical properties through modifying and engineering its surface.[2,3] Importantly, GO can be considered as an inexpensive and convenient intermediate for large scale production of graphene-like materials such as reduced graphene oxide (rGO). In this work, both thermal and chemical reduction processes are employed to achieve rGO material with different degree of reduction.[4] For each method applied, the scalability of the process was explored and optimized together with the chemical and physical properties of the modified material.

Furthermore, functionalization on the graphene oxide is also reported in this work.[5,6] Covalent amine functionalization were implemented not only to enhance and expand graphene oxide properties, but also to better disperse graphene-like material in different organic solvents (Figure 2).[7] In order to allow a systematic study of the morphological, structural and functionalization information of the GO and rGO materials, various techniques were employed such as FT-IR, SEM, XPS, XRD; NMR solid state, FT-Raman and TGA.

References

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Figures

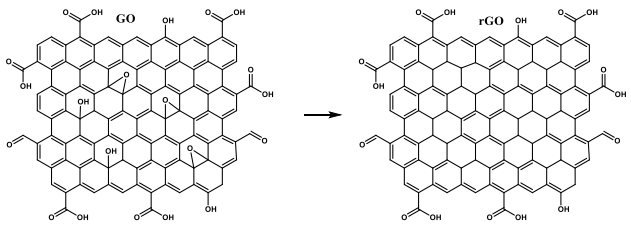

Figure 1: General scheme for rGO synthesis using chemical or thermal reduction

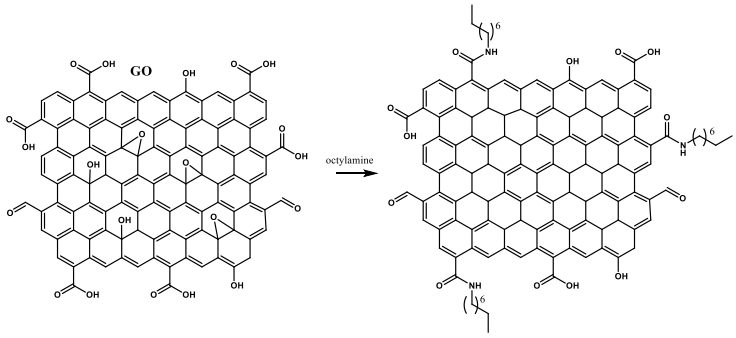

Figure 2: General scheme for amine functionalization and partial reduction of graphene oxide with octylamine