Non-conventional covalent modification of graphene under microwave conditions

Manuel Vázquez Sulleiro,[a,c] Alejandro Criado,[a,c] Sabela Quiroga,[b] Diego Peña,[b] Dolores Pérez,[b] Enrique Guitián,[b] Maurizio Prato[a,c]

[a] Department of Chemical and Pharmaceutical Sciences, University of Trieste, P.le Europa 1, 34127 Trieste, Italy.
[b] Centro Singular de Investigación en Química Biológica y Materiales Moleculares (CIQUS), C/Jenaro de la Fuente s/n, 15782, Santiago de Compostela, Spain.
[c] Carbon Nanobiotechnology Group, CICbiomaGUNE, Ed. Pº Miramón 182, 20009 Guipúzcoa, Spain.
e-mail: manuel.vazquez.sulleiro@gmail.com

Graphene is a promising next-generation material with a unique set of electronic, mechanical, and thermal properties. Consequently, graphene exhibits a wide variety of potential applications in the field of biomedicine such as sensing, bioelectronics, implants and drug delivery.[1] Besides, chemical functionalization of graphene is a topic of paramount importance, because it allows the fine-tuning of material's chemical and physical properties.[2] Surface modification of graphene frequently requires tedious and long procedures. However, the use of non-conventional conditions reduces timing, avoids unstable suspensions and improves the reaction efficiency.[3]

This project is focused on relatively unexplored cycloaddition reactions of arynes with exfoliated graphene. In particular, we generated different arynes by thermal decomposition of the corresponding aryl anhydride at high temperatures by microwave irradiation using solvent-free conditions (Figure 1). Graphene played two roles in this reaction process: as reagent and as microwave absorbing matrix.

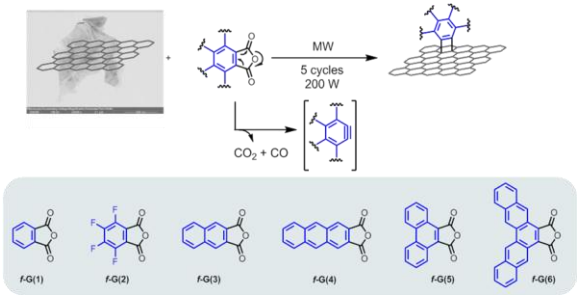

Figure 1: Schematic representation of the chemical modification of graphene.

In conclusion, we have developed effective and controlled methods to functionalize different graphene derivatives, in order to modulate their properties and to specifically adequate the material as a component for new medical devices in the future.[4]

References

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