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Development of methods for Graphene production and chemical modification

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Abstract

The field of graphene has drawn much attention over the last 6-8 years mainly due to the outstanding properties of graphene and its potential for application in almost every discipline including electronics, aeronautics, biomedicine, energy storage, etc. However, there are two issues that represent a problem from the practical point of view and need to be resolved: 1) the lack of an effective method for the synthesis of high quality graphene in large quantities, and 2) the inertness of graphene, which limits its processability and therefore its incorporation into, for instance, biological systems.

Our investigation is devoted to solve these two issues and this talk will present an overview of existing methods for graphene synthesis, and will highlight the advantages and weaknesses of using electrochemical tools. Moreover a series of synthetic strategies addressed in our laboratory for the covalent modification of graphene with simple molecules bearing different functional groups (NH2, COOH, SO3H, -C・C-, etc.), and polymers will be described. These methods include esterification/amidation, coupling with diazonium salts, nitrene chemistry and 1,3-dipolar cycloaddition generally known as “click” reactions.

In spite of the important differences between these routes, all the reactions proceed relatively well. In fact some of these reactions have been successful for the direct modification of graphene with polymers. The methodology has been applied to a wide variety of polymer families, including biocompatible poly (vinyl alcohol) and poly (ethylene oxide).

Biography

Horacio J. Salavagione obtained his BSc in Chemistry (1998) and PhD in Chemistry (2003) from the National University of Río Cuarto (Argentina). He moved to the University of Alicante where he spent three years as a Postdoctoral Fellow working on conducting polymers. He presently holds a Ramon y Cajal Senior Research Fellowship at the Institute of Polymer Science and Technology, of the Spanish Scientific Research Council, CSIC. He has published around 40 scientific papers and 2 book chapters. His current research interests are centered on novel materials for functional applications, including chemical functionalization of graphene and carbon nanotubes, and the design and preparation of carbon nanotubes and graphene-based polymer nanocomposites.