New insights in the electronic transport in reduced graphene oxide using Scanning Electrochemical Microscopy

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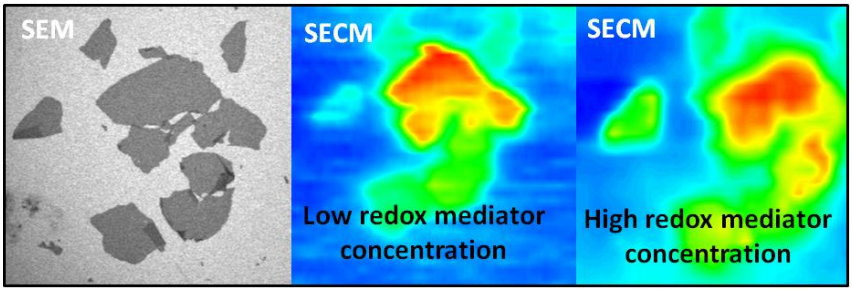
T. Bourgeteau, S. Le Vot, M. Bertucchi, V. Derycke, B. Jousselme, S. Campidelli, R. Cornut
CEA Saclay, IRAMIS, NIMBE (UMR 3685), LICSEN
Gif-sur-Yvette Cedex F-91191, France
renaud.cornut@cea.fr

Graphene and graphene analogues such as GO or reduced-GO (r-GO) are attracting increasing attention from the scientific community.[1] These materials have outstanding properties, so that many potential applications in the fields of electronics, sensors, catalysis and energy storage are being considered. GO combines several advantages such as availability in large quantity, low cost and easy processability. However, contrary to graphene, GO is electronically insulating and has to be reduced into a conductive material, r-GO.

In a recent work[2] we introduced a new localized functionalization method of GO deposited on a silicon oxide surface based on its reduction at the local scale thanks to scanning electrochemical microscopy (SECM): the reducer is generated at the microelectrode, that is moved close to the substrate. The recovery of electronic conductivity upon reduction enables the selective electrochemical functionalization of patterns.

In the present work, we introduce a new method to evaluate at a local scale the conductivity of r-GO layers with SECM.[3] In addition we show how images of individual and interconnected flakes directly reveal the signature of the contact resistance between flakes in a non-contact and substrate-independent way.[4] Quantitative evaluation of the parameters is achieved with the support of numerical simulations to interpret the experimental results.

Overall, these works illustrates the high potential and versatility of SECM to investigate and functionalize 2D materials.



Presentation of the combined SEM-SECM responses at the basis of the advanced electronic conduction characterization.[4]

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