International
Workshop on Electrochemistry of Electroactive Materials
June 16–21, 2019, Borovets, Bulgaria
WEEM-2019

Enhanced performances of RGO-AuNPs hybrids towards electroanalytical applications

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In recent years, lot of attention has been devoted to understanding the properties of hybrid nanocomposites, “brave new materials” made of two or more organic and inorganic components. These systems show enhanced or novel physico-chemical properties with respect to the single components, resulting not only from the sum of the precursors’ ones, but also from interactions occurring at their interface, the so-called “heterojunction”. However, a remaining challenge is to understand in depth the phenomena here originating. In the present work, to start fulfilling this gap, a deep electrochemical study of hybrids made of Reduced Graphene Oxide (RGO) and Au nanoparticles (NPs) is performed, analysing carefully the role played by each single component of the material on the electrochemical properties. In more details, RGO platforms are surface functionalized with 1-aminopyrene or 1-pyrene carboxylic acid that act as heteronucleation and growing sites of the amine- or thiol-coated Au NPs of different dimensions (from 3 to 20 nm). At first, Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS) measurements are carried out in order to characterize the different hybrids. Then, the materials are applied as electroanalytical sensors for both organic and inorganic molecules (dopamine and As, respectively) with very promising results, comparable or even better than analogous systems reported in literature [1-2]. Moreover, preliminary tests on H_2O_2 detection open the venue to the application of these materials in biosensor applications. The properties of the hybrid nanocomposite, enhanced with respect to those of the single components, are ascribed to charge transfer occurring at the heterojunction from the Au NPs to the RGO, assisted and channelled by the pyrene linker.

Acknowledgments: The authors acknowledge the MIUR National Project PRIN 2012 (prot. 20128ZZS2H).

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- Preferable accommodation: Single Room