

CVD graphene/Ni interface evolution in acidic media

Luca Camilli¹, Feng Yu¹, Miriam Galbiati¹, Peter Bøggild¹, Rossella Yivlialin², Lamberto Duò², Gianlorenzo Bussetti²

¹*Technical University of Denmark, Ørsteds Plads, Kgs. Lyngby, Denmark*

²*Department of Physics, Politecnico di Milano, p.za Leonardo da Vinci 32, I-20133 Milano, Italy*

lcam@nanotech.dtu.dk

Atomically-thin, ultra-light, almost completely transparent and impermeable, with remarkable mechanical properties: graphene may represent the ultimate surface modification that can be applied to metals and other substrates in order to improve their intrinsic properties. In this context, probing the effect of the deposition of 2D materials on the surface of metal electrodes immersed in an electrolyte and subjected to redox reactions becomes very important both from a scientific and a technological point of view, as possible applications of graphene-coated metal substrates range from hydrogen production [1] to ion batteries [2], from corrosion protection [3,4] to catalysis [5].

Motivated by the observation of spontaneous hydrogen formation in the multilayer graphene-coated nickel (MLGr/Ni) system when immersed in acidic media [3], here we present an in-situ study of the electrochemical properties of MLGr/Ni and of highly oriented pyrolytic graphite (HOPG). HOPG is considered here as an infinite multilayer system of graphene. A methodical comparative study between MLGr/Ni and HOPG samples is conducted in sulphuric acid (0.5 M), where in-situ atomic force microscopy (AFM) and cyclic voltammetry (CV) are used to fingerprint the sample surface morphology and redox processes, respectively.

We show that, surprisingly, the electrochemical behavior of the MLGr/Ni system more closely resembles that of bare Ni, rather than that of HOPG and we discuss the role of the presence of wrinkles on the MLGr surface to likely be the main reason for the higher electrochemical activity of the MLGr/Ni sample with respect to the HOPG [6].

References:

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