# NPs-Graphene hybrids dispersion by electrochemical methods

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Nanohybrid materials containing graphene sheets have emerged as new model of materials with vast potentials in electronics, optoelectronics, energy technology, membrane design, sensing and biomedical applications. Last years, we have designed hybrid platforms with graphene and Nps in order to improve the surface analysis methods such as SERS (surface-enhanced Raman scattering) and TERS (tip-enhancement Raman spectroscopy).[1]

In this communication, we show simple electrochemical strategies[2,3] carried out for obtaining hybrid Nps-Graphene structures (Pd-GO and AuPd-GO) dispersed in solution. The free-standing hybrid structures in aqueous solution were obtained by galvanostatic electroreduction of GO dispersion in the presence of metallic precursors and stabilizing agents, under controlled agitation of the electrolyte (Fig. 1)[2].

The morphology and structure of hybrid materials were determined by optical, Atomic force and electronic microscopies (SEM and TEM), while the chemical information was recorded through EDS, XPS and Raman spectroscopies (Fig. 2).

Applications are shown by using the hybrid nanostructures as modifiers of the nickel surface for increasing the catalytic activity of the electrode for the evolution of hydrogen (HER). Electrocatalytic activity was comparatively performed by incorporation of Nitrogen-doped GO and $MoS_2$ partides in the nickel matrix[3].

## References

[1] LA Pérez, MC Dalfovo, HE Troiani, AL Soldati, GI Lacconi, FJ Ibañez, J. Phys. Chem. C 120 (2016) 8315
[2] PM Uberman, LA Pérez, SE Martín, GI Lacconi, RSC Adv 4 (2014) 12330.
[3] EA Franceschini, GI Lacconi GI, Electrocatalysis, 9 (2018) 47.

## Figures

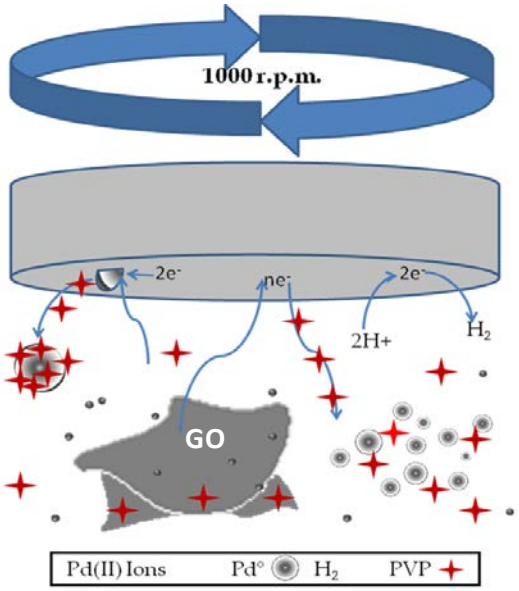


**Figure 1.** Representative scheme of the electrochemical process for the formation of stabilized PdNPs-GO hybrids.

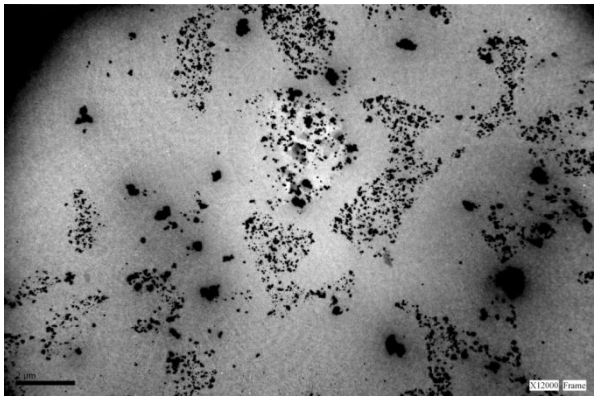

**Figure 2.** Transmision electron micrography of a AuPdNps-GO hybrid sample.