Langmuir-Blodgett and Langmuir-Schaefer Films of GRAnPH®: The Role of Oxidative Debris.

López-Díaz, D[(1)]; S. Blanco[(2)]; P. Merino[(2)]; A. Pérez[(2)]; C. Merino[(2)]; M.M Velázquez[(1)]

(1) Dpto. de Química Física. Facultad de Ciencias Químicas. Universidad de Salamanca (Spain).

(2) Grupo Antolin Ingeniería SA – GRAnPH Nanotech. Burgos (Spain).

dld@usal.es

It has recently published that graphene oxide (GO) obtained from graphite by Hummers' oxidation is composed by nanoplatelets, named as GOP and oxidative debris (OD)[1]. OD seems to be composed by highly oxidative aromatic molecules coming from rupture of the sheets and they are adsorbed on the top of the nanoplatelets. The existence of OD modifies the physical and chemical properties of the material, such us, solubility in water, oxidation degree, electrical conductivity[1] etc.

We present results corresponding to the study of the effect of the oxidative structures on the properties of graphene oxide GRAnPH® prepared by oxidation of Carbon Nanofibers (GANF®) supplied by Grupo Antolín. To analyze the quality of purified material, GOP, UV-Vis and XPS spectroscopies, X-Ray Diffraction and Zeta Potential measurements have been used.

The results show a red shift in UV-Vis characteristic of the material reduction and the increase of 20% in the percentage of Csp^2 when the impurities are removed. Moreover, a decrease in the interlayer distance and a decrease of the zeta potential values have been found. All these results indicate that purified GRAnPH® graphene oxide presents properties similar to the reduced graphene oxide (RGO). So that, the purified process renders samples with similar properties to the reduced graphene oxide by conventional methods.

A great variety of applications involving graphene materials require its deposition onto wafers. Spin coating or Drop Casting methods do not result the best techniques because they have low reproducibility and drop evaporation produces stacking and agglomeration of the material. To improve the wafer recovery and decrease the material agglomeration, we suggest Langmuir-Blodgett (LB) and Langmuir-Schaefer (LS) methodologies. The morphology of different films was studied by AFM and FE-SEM. Results show that the LB technique renders a higher recovery than the LS one. In addition, the morphology and recovery can be related with the nature of the wafer and the composition of the GRAnPH®[2].

Bibliography

1. J. P. Rourke, P. A. Pandey, J. J. Moore, M. Bates, I. A. Kinloch, R.J. Young, N.R. Wilson; Angew. Chem. 50 (2011) 3173.
2. Martín-García, B.; Velázquez, M.M.; Rossella, F.; Bellani, V.; Diez, E.; Fierro, J.L.G.; Perez-Hernández, J.A.; Hernández-Toro, J.; Claramunt, S.; Cirera, A; Chem.Phys.Chem. 13 (2012) 3682.

Acknowledgement

- Ministerio de Economía y Competitividad, **IPT-2012-0429-420000**, and CDTI, **IDI-20111312**, for financial support.
- The Center for Ultrashort Ultraintense Pulsed Lasers (CLPU) and Dr. José Luis García Fierro (Instituto de Catálisis y Petroleoquímica, CSIC) for AFM and XPS measurements, respectively.