Synthesis of NPs@GO and NPs@rGO aerogel composites using $scCO_2$

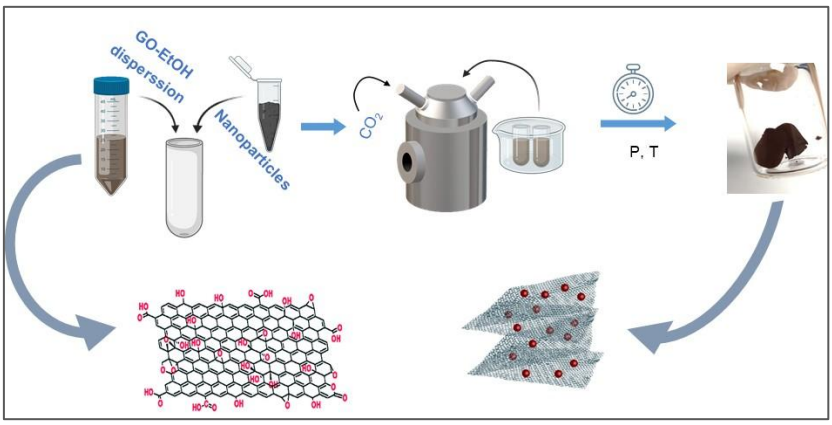
Ana M. López-Periago, Márta Kubovics, Alejandro Borras, Albert Rosado, Julio Fraile, Concepción Domingo

Instituto de Ciencia de Materiales de Barcelona (ICMAB-CSIC), Campus UAB, 08193, Bellaterra, Spain.
amlopez@icmab.es

The interest of researchers in aerogels is widely recognized due to their high porosity, extremely low density, and large surface areas, that allow multiple applications. More recently, the preparations of aerogel-based composites with nanoparticles have found their way for new and more challenging applications ranging from gas capture, catalysis, or for biomedical applications. At the SFFM group at ICMAB-CSIC we are working on the use of supercritical CO2 technology for the preparation of graphene oxide (GO) and reduced GO (rGO) aerogels functionalized with nanoparticles (NPs) of different nature.

The hydrophilic character of GO allows the preparation of stable colloidal dispersions in water or alcohol, which has allowed the design of a method to produce the gelation and drying of the dispersions in the presence of $scCO_2$, giving rise to aerogels [1], in which most of the oxygenated groups on the surface are maintained. The preservation of these oxygen containing functional groups (epoxide, carboxyl and alcohol) appear to assist in the anchoring process of those materials needed to fabricate the aerogel GO-composite. Under these lines, magnetiteNPs@GO composite was successfully prepared using $scCO_2$ for MRI applications [2].

In this conference we will show the recent advances of our research group involving the preparation of composites of GO and rGO aerogels with NPS of Metal-Organic Frameworks (MOFs), metal oxide NPs, and metal NPs. These new materials will serve as a platform for numerous applications, highlighting those involving pollutant removal treatment and catalytic applications.



Acknowledgements

The authors acknowledge the project CTQ2017-83632 for funding. A.L.-P and C.D. acknowledge the financial support from the Spanish MEC, through the Severo Ochoa Program for Centres of Excellence in R&D FUNFUTURE (CEX2019-000917-S). M. K. acknowledges the financial support from the European Union's Horizon 2020 research and innovation program under the Marie Sklodowska-Curie grant agreement No 754397. A.B. and A.R. acknowledge the FPI grant.

References

[1] Borrás A., Gonçalves G., Marban G., Sandoval S., Pinto S., Marques P. A.A.P, Fraile J, Tobias G., López-Periago, A.M, Domingo C., "Preparation and characterization of graphene oxide aerogels: Exploring the limits of supercritical CO_2 fabrication methods", *Chemistry - A European Journal. 2018, 24, (59), 15903-15911.*

[2] Borras, A., Fraile, J., Rosado, A., Marbán, G., Tobias, G., López-Periago, A., Domingo, C., "Green and Solvent-Free Supercritical CO2-Assisted Production of Superparamagnetic Graphene Oxide Aerogels: Application as a Superior Contrast Agent in MRI", *ACS Sustainable Chem. Eng*. 2020, 8 (12), 4877–4888.