Short CV

Ester Vázquez Fernández-Pacheco obtained her PhD degree from the University of Castilla-la Mancha (UCLM) in 2000. She performed her doctoral research mainly in the Microwave and Sustainable Chemistry group of UCLM, working on microwave-assisted organic reactions in dry media. She also spent a few months at the University of Zaragoza, studying silica-supported Lewis acids for catalysis and at the Karolinska Institute in Stockholm, working on microwave applications in radiolabelling tracers for positron emission tomography. After finishing her PhD, she carried out her postdoctoral training in Trieste, Italy, working on biological applications of fullerenes and new fullerenes derivatives in the group of Professor Maurizio Prato, in the frame of a European Research Training Network. She then joined the Faculty of Chemistry at UCLM in 2001, completing other short stays in Trieste in 2002 and 2003. In 2009 she received the "Ibn Wafid de Toledo"Price for young researchers of Castilla-La Mancha. She was promoted to associate professor in 2010.

Over the past 10 years Ester Vázquez has focused her research efforts on the functionalization and purification of carbon nanostructures using non conventional methodologies, demonstrating how scaling-up of the modified carbon nanostructures is possible using green protocols. Her group (MSOC Nanochemistry) has used microwave radiation for the activation of carbon nanostructures in solvent-free conditions, preparing multifunctional derivatives that can serve as versatile synthons in materials science and biological applications. Thus, functionalization of carbon nanostructures with dendrimers under microwave irradiation has been applied to the preparation of non-viral agents for gene therapy.

Ball milling methodologies in dry media have also being used to cut and functionalize carbon nanotubes and recently, for the exfoliation of graphite and the preparation of stable graphene sheets dispersions in many solvents. This protocol represents, today, one of the best ways of producing stable aqueous dispersions of graphene in macroscopic quantities and has permitted the collaboration with different companies interested in graphene production. The graphene dispersions can be used for a number of applications, including toxicological and environmental studies, and open the door to the preparation of new graphene composites.

MSOC Nanochemisty group. UCLM.

http://www.i-m.co/esaudelrio/MSOC_Nanochemistry_Group/

You can find us at the Nanotechnology Laboratory at the **IRICA** (**I**nstituto **R**egional de **I**nvestigación **C**ientífica **A**plicada) Institute, UCLM, Ciudad Real. Spain.

Selected publications (last 5 years):

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12. Montellano Lopez, A.; Scarel, F.; Rubio Carrero, N.; Vázquez, E.; Mateo-Alonso, A.; Da Ros, T.; Prato, M. Synthesis and Characterization of Highly Water-Soluble Dendrofulleropyrrolidine Bisadducts with DNA Binding Activity. Organic Letters, 14, 4450-4453, (2012).

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Abstract of seminar

Modification of Carbon Nanoforms under Non-Conventional Techniques: Applications

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Several techniques have been used to modify Carbon Nanoforms (CNFs), modulating their morphology or introducing different functional groups onto their surface [1]. Even though the solubility of CNFs in common solvents is really very low, the main methods for transforming them have so far involved the use of traditional chemical techniques, such as refluxing and sonication, in the presence of large amounts of strong inorganic acids or organic solvents, over long periods of time. The modification of CNFs in the absence of any solvent has many advantages over solution reactions: a) this methodology does not suffer the solubility problems of CNFs; and b) the solid-state reactions have many benefits: reduced pollution, low costs, and simplicity in process and handling. These factors are especially important for scalable production.

There is an increasing number of publications demonstrating the advantages that technologies such as microwaves and ball milling, can offer for the modification of different compounds, in solvent-free conditions. In the present work we summarize our achievements in the modification of Carbon Nanotubes (CNTs) and Carbon Nanohorns (CNHs). It has been shown that these structures display strong microwave absorbing properties [2] and this behaviour have been used for purification and functionalization [3]. Another stimulating possibility is the ball milling approach where chemical bonds are activated by the presence of an external mechanical force.[4] Both methods pave the way for green protocols and large-scale modifications while avoiding significant degradation of the structure.

Ball milling processes have also been applied to the exfoliation of graphite flakes to form stable dispersions of double- and few-layer graphene sheets.[5-6]. The methodology opens the way for an alternative and efficient processing of graphene materials, such as film deposition and chemical functionalization. Moreover these results are particularly attractive because provide a basic for further experimental and theoretical exploration, where derivatives of aminotriazines can be designed to form extensively hydrogen bonded 2D molecular assemblies on graphene.

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