Synthesis of carbonaceous hybrid materials with high dispersion capacity in aqueous medium.

IX SIMPOSIO de Investigación EN CIENCIAS EXPERIMENTALES

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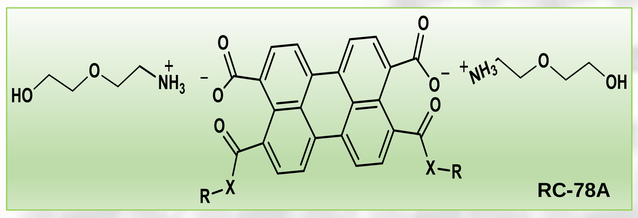
INTRODUCTION

Graphene is the youngest discovered carbon allotrope (2004) [1]. Owing to interesting combination of their qualities such as dimensions, structure, mechanical and electronic properties, it is considered one of the most promising materials for high performance applications, for example, in biomaterials manufacturing or molecular electronics production.

Nevertheless, one of the Graphene materials' main problems is the low capacity of adaptation to different media, especially in biological or polar media [2], mainly due to the low dispersibility in them. Graphene surface functionalization with aromatic molecules such as perylene diimide derivatives (PDI´s) (**Figure 1**), by means of π-π interactions, has become a good strategy to overcome this problem. Thus, functionalization based on adsorption of aromatic molecules (PDI´s) on graphene surface, which not cause damage to sp^2 atoms network, allows keeping their primary property .

In this context, we proposed to develop a new functionalization strategy deployed in two stages. Firstly, adsorption of soluble receptors onto graphene surface. Secondly an "in situ" transformation of receptors to improve their interaction to the graphene surface leaving available chemical functions (F in **Figure 1**) to interact with other species and/or different chemical media.

RESULTS AND DISCUSSION



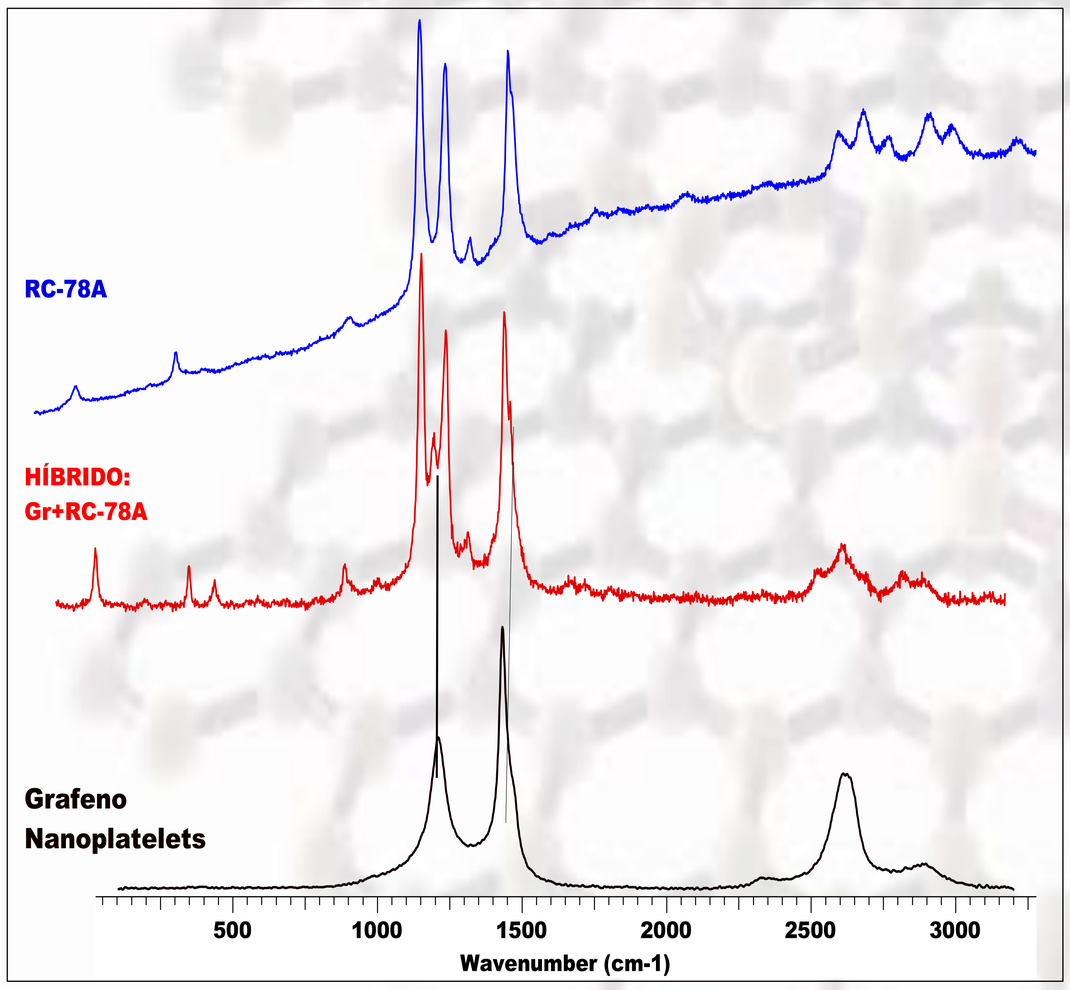


Figure 2. RAMAN spectral of: Graphene Nanoplatelets, one of bulk samples used and the hybrid material. (λex= 532nm)

- Presence of adsorbate in the hybrid is clear in the RAMAN spectrum (**Figure 2**). Energy transfer occur in the hybrid material because the fluorescence background is eliminated at 532 nm (**Figure 2**).
- A width exothermic peak appears at 140ºC in the DSC spectrum. It could be a transformation process to perylene diimide (PDI´s) (**Figure 3A**).
- Transformation of soluble receptors to PDI´s derivatives by means of temperature at 140ºC. It can be seen, in the IR spectrum (**Figure 3B**). Therefore, the result of the DSC is consistent.
- In the **Figure 3C** shows a good dispersión of hybrid material formed by PDI derivate and Graphene Nanoplatelets.

CONCLUSIONS

The develop a new functionalization strategy deployed in two stages has been successful. Firstly, adsorption of soluble receptors onto graphene surface Secondly an "in situ" transformation of receptors to improve their interaction to the graphene surface while leaving available chemical functions to interact with other species and/or different chemical media it has also been successful.

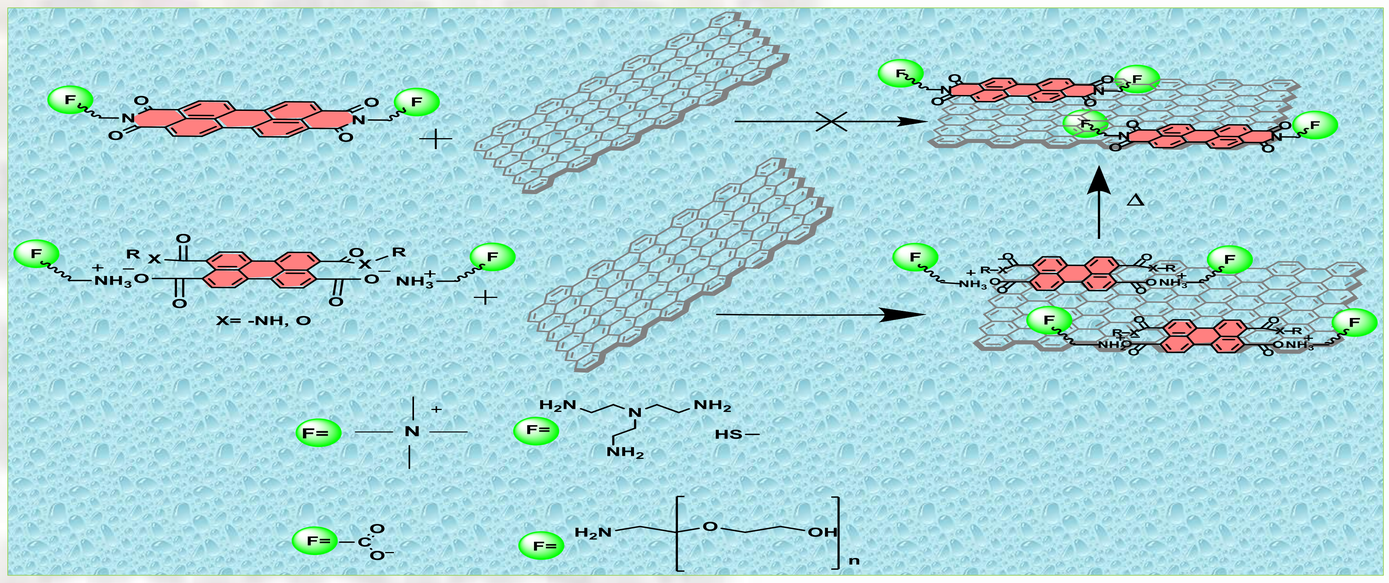


Figure 1. New functionalization strategy of PDI derivates on graphene Nanoplatelets

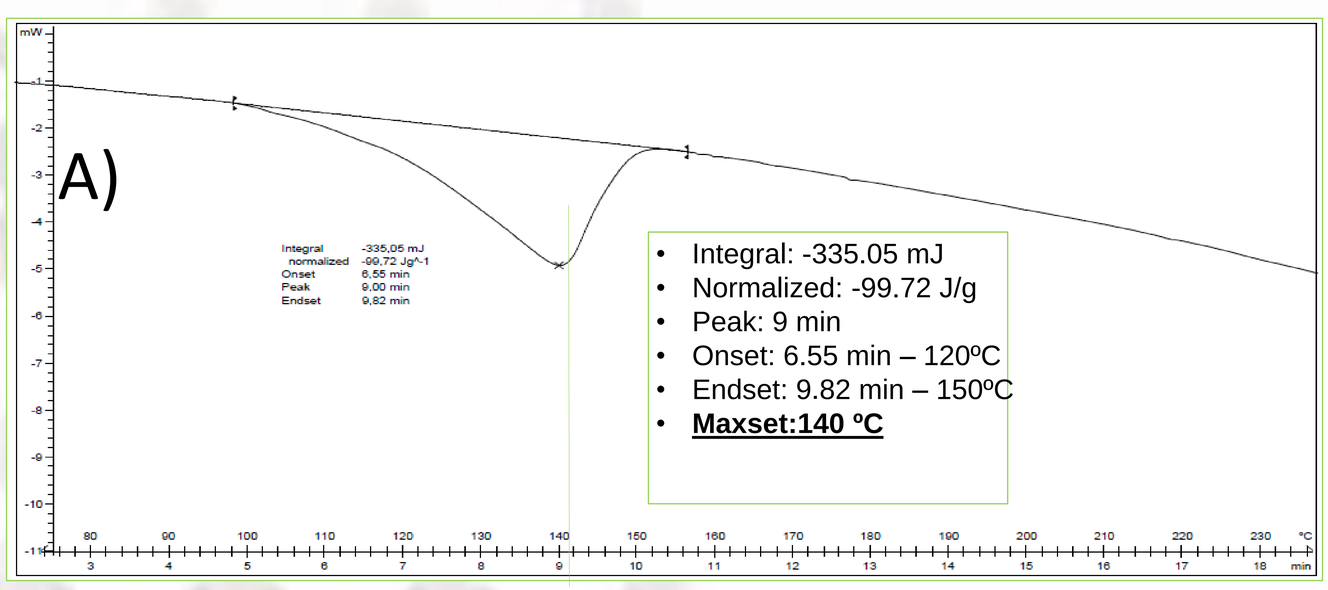


Figure 3. A) Differencial scanning calolimetric (DSC) for one of the samples used. B) IR to PDI transformation at temperature indicated in DSC. C) Hybrid material in acuous media.

REFERENCES

[1] N. V. kozhemyakina, J. M. eglert, C. D. Schmidt, et al. Adv.mater. 2010, 22, 5483-5487.

[2] F. Würthner, T. Kaiser, C. R. Saha-Möller. Angewandte Chemie. 2011, 50(15), 3376–3410.

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