

A Novel Graphene Oxide-Silica Nanohybrid, Highly Functionalized by Organic Fluorotails

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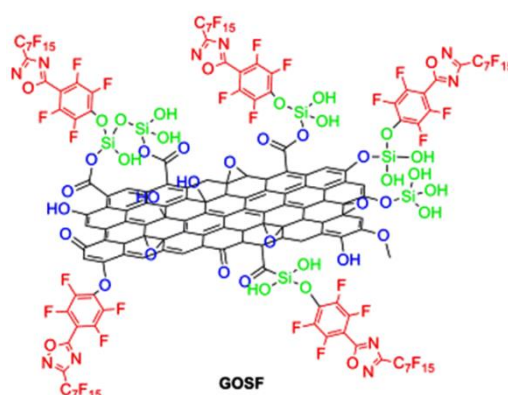
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GO-based composites have attracted increasing attention due to their improved properties: in this context Silica-GO nanohybrids are currently used in many fields, ranging from biomedicine to optoelectronics.

In recent years growing interest of the materials community has been posed on the functionalization of graphene materials with fluorine: Fluorinated graphene oxide has been proven to be the first carbon material for Magnetic Resonance Imaging without the addition of magnetic nanoparticles,¹ moreover, has proven to absorb NIR-laser energy and efficiently transform it into heat, so that fluorinated graphene oxide has been suggested as a contrast agent for MRI, ultrasound and photoacoustic imaging, and also as targetable drug carrier and NIR laser inducible hyperthermic material that can ablate thermosensitive cancer cells.²

In this study we prepared a novel hybrid material with the particular combination of a GO matrix, grafted by silica nanoparticles and further functionalized by highly fluorinated oxadiazole moieties (FOXAR) by nucleophilic substitution (Figure).



The characterization of the materials, performed by FTIR, SEM-EDAX, ¹³C {¹H} MAS NMR and ¹⁹F MAS NMR, allowed to state that FOXAR is covalently bonded to the GOS. Moreover, oxygen uptake and release kinetics were performed on oxygen saturated aqueous solutions containing GOS or GOSF at atmospheric pressure by means of a previously reported saturation method,³ at 25°C and at 0.5 mg/ml.

Collected data highlight that fluoro-functionalization increases the dissolved oxygen content at saturation: notably, for GOSF we observe a faster O₂ uptake than unfluorinated GOS and a slower O₂ release during desaturation.

¹ Yun Hang Hu, *Small*, **2014**, 10, 1451–1452.

² R. Romero-Aburto, T. N. Narayanan, Y. Nagaoka, T. Hasumura, T. M. Mitcham, T. Fukuda, P. J. Cox, R. R. Bouchard, T. Maekawa, D. S. Kumar, S. V. Torti, S. A. Mani, P. M. Ajayan, *Adv. Mater.* **2013**, 25, 5632–5637.

³ F. S. Palumbo, M. Di Stefano, A. Palumbo Piccionello, C. Fiorica, G. Pitarresi, I. Pibiri, S. Buscemi, G. Giammona, *RSC Advances*, **2014**, 4 (44), 22894-22901.