Edge-Selective Functionalization of Grapite Nanoplatelets for the Exploitation in Thermally Conductive Nanomaterials

M.Mar Bernal[1]
Chiara Novara[2]
Samuele Colonna[1]
Alberto Fina[1]

[1]*Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, 15121 Alessandria, Italy*
[2]*Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, 10129 Torino, Italy*

maria.bernal@polito.it

The increase demand on novel and multifunctional materials has focused the attention on two-dimensional (2D) graphene-based structures due to their unique physico-chemical properties. The subject of our research is aimed at grafting of molecules to these carbon nanomaterials to obtain engineered nanoparticles able to further react or assemble in a controlled way.
In particular, the scope of this work is to build a molecular bridge between nanoflakes aiming at modulating the electrical and thermal conductivities of graphene nanopapers. While functionalization of graphite nanoplatelets (GnP) may clearly affect the contact resistance between nanoflakes, extensive functionalization on the graphene planes has to be avoided to preserve the high conductivity associated to defect-free sp^2 structure. Therefore, edge-selective covalent functionalization of GnP was performed in this work, by arylation with diazonium salts generated in situ (Figure 1). The edge-functionalized GnP (e-GnP) were characterized by Raman spectroscopy, X-ray photoelectron spectrosocopy, and field emission scanning electron microscopy, demonstrating successful grafting of organic molecules towards the edges of the nanoflakes. Furthermore, e-GnP were used to fabricate nanopapers by flow-directed filtration-induced technique.

References

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Figures

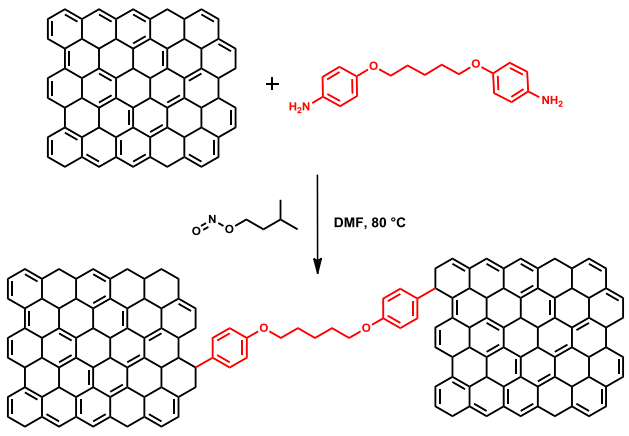

Figure 1: Edge-selective functionalization of GnP.