Molecularly Pillared Graphene-based materials with diamine crosslinking: Synthesis and Characterization

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Graphene structures have been extensively studied due to their excellent properties, such as its single atom thickness, low weight, large carrier mobility and mechanical toughness. Ideally, any modifications for specific applications should not annihilate any valuable properties of the material. 3D stacks of graphene covalently bonded through intercalated organic molecules is a promising way to control the electronic structure properties of these materials, their elastic properties, and their porosity [1]. The aim of present study is to design Molecularly Pillared Graphene (MPG) from successive graphene sheets crosslinked with diamine organic molecules (molecular pillars) to create 3D stacking materials with controlled electronic and mechanical properties. The factors that allow the control of these properties are the chemical composition of the molecular pillar, the density of the pillars grafted on the graphene sheets and the linking groups employed for attaching the molecular pillars to the graphene sheets. For the preparation of these materials, we used reduced graphene oxide (rGO) with various level of reduction and diamine organic molecules. Benzidine (1,1'-biphenyl-4,4'-diamine) and 2,7-diaminonapthalene were some of the organic molecules selected to act as molecular pillars. All samples were fully characterized with a variety of techniques including XRD, XPS, FT-IR, TGA and SEM.

References

[1] Belluci, L.; Tozzini, V. Engineering 3D Graphene-Based Materials: State of the Art and Perspectives. Molecules 2020, 25, 339.

Figures

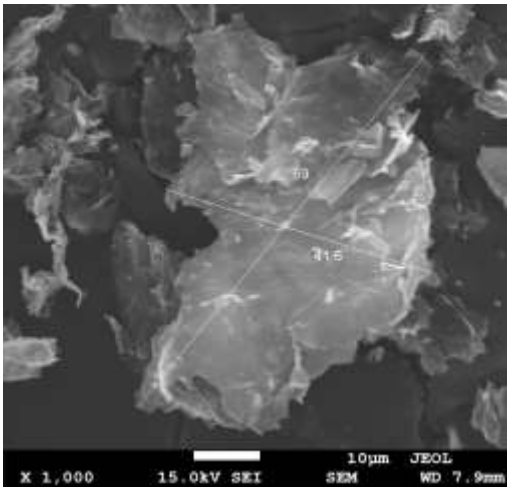

Figure 1: SEM figure of 3D graphene crosslinked with 1,1'-biphenyl-4,4'-diamine.

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