GRAPHENE OXIDE-QUATERTHIOPHENE COMPOSITES OBTAINED BY MICROWAVE-ASSISTED SYNTHESIS

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Graphene is constituted by one-atom-thick sheets of carbon atoms, arranged in a hexagonal lattice, having outstanding mechanical and electronic properties. While a great effort has been addressed to the detailed investigation and optimization of its physical properties, the chemistry of graphene is still a rather unexplored field of research. Current challenges include the controlled chemical functionalization of graphene with functional units to achieve both a good processability in various media and a fine tuning of various physico-chemical properties of the 2D architecture, paving the way towards its technological application in chemical engineering. In this frame graphene oxide (GO), because of its easier production and processability as well as simple chemical functionalization if compared to graphene, is emerging as a versatile material for applications in nanoscience and nanotechnology. GO can be obtained in high yield by controlled chemical oxidation of graphite; the resulting oxidized single sheets are characterized by the presence of epoxy and hydroxyl groups covalently linked to the C atoms of the graphene basal planes, as well as carbonyl and carboxyl groups placed at the edges. Such functional groups can be exploited for the selective intercalation or adsorption of ions and molecules as well as for covalent modifications.
Graphene oxide (GO) exfoliated sheets [2] were used as two dimensional platforms to covalently tether on their surface thousands of optically active quaterthiophene [3] molecules (T4), using an innovative microwave-assisted silanization reaction. This method allowed to perform GO functionalization in one-step, under mild conditions in a few tens of minutes rather than days. The hybrid GOT4 could be processed in either H_2O or apolar organic solvents and deposited as single sheets, microplatelets or macroscopic membranes. Absorption/emission spectroscopy reveals that GOT4 combines limited T4-T4 interactions with strong T4-GO ones. These findings, combined with the "user-friendly" engineering approach presented here, pave the way towards the bottom-up fabrication of new GO-based tailored materials for electronics, sensors and biological applications [1].

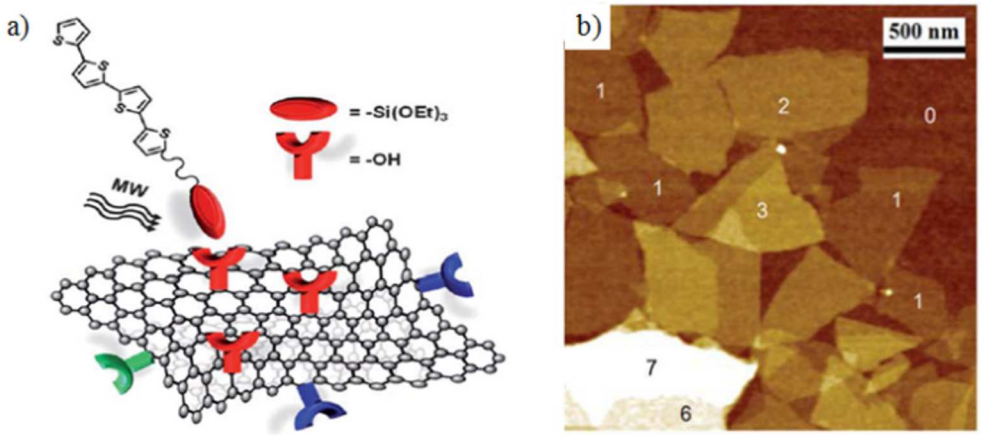

Figure 1: (a) Sketch of the presented one-step functionalization approach. (b) AFM image of exfoliated GOT4 sheets spin-coated on silicon. Z-range = 8 nm [1].

References

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