

Multi-layer graphene obtained by exfoliation of graphite in the presence of 3,7-dihydroxyflavone in dimethyl sulfoxide.

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Graphene, one bidimensional material constituted hexagonal rings of carbon sp^2 , has been studied due to its exceptional electronic, optical and mechanical properties.¹ However, its application in the biological area is less explored. Abdolahad and coworkers² showed that polyphenols (from green tea) attached nanosheets of graphene was efficient in mediate the photodestruction of cancer cells.² In this work, an alternative method to obtain polyphenols attached to graphene was tested. Instead of first prepare graphene oxide and then reduced it to graphene, the exfoliation of graphite in the presence of 3,7-dihydroxyflavone (3,7-diHF) was used. 10mg Graphite (150 μ of flake size) was added to 10mL of 3,7-dihydroxyflavone (3,92mmol/L) solution in dimethyl sulfoxide (DMSO). The dispersions was bath sonicated for 1h30 and centrifuged for 15minutes at 3000rpm. The electronic spectra of 3,7-diHF in DMSO (fig. 1a) show one band at 340nm with two shoulders at 324 e 354nm assigned to $\pi\pi^*$

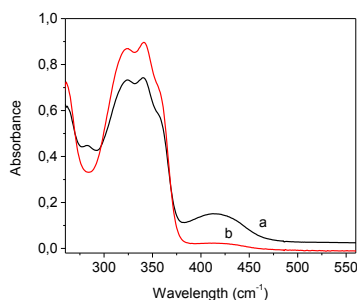


Figura 1. Electronic spectra of 3,7-diHF in DMSO in the ausence (a) and in the presence of graphene(b).

transitions. The other band observed at 412nm was attributed to deprotonation of the 3-OH group induced by solvent, by analogy with similar flavonoid.³ In the presence of graphene the intensity of the band at 340nm increased, while a band at 420nm decreased (fig. 1b). This fact probably is due to interaction between 3,7-diHF and graphene, which compete with the solvent by flavonoid and restore it to the neutral form.

In the Raman spectrum of graphene, three peaks were observed at 1348, 1587 and 2726 cm^{-1} , called D, G and 2D bands, respectively. The more intense peak(G) is attributed to the high-frequency E_{2g} phonon at Γ and the D peak to the breathing modes of six atoms rings and requires a defect for its activation. The 2D peak is the D-peak overtone.⁴ In the presence of 3,7-diHF, the bands shifted to lower wavenumber, and compared to the green tea reduced graphene oxide, described in the literature,² it has less defects, because the intensity of D-peak is lower. The data obtained indicate that a graphene with less defects can be produced by graphite exfoliation in the presence of 3,7-dihydroxyflavone.

References

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