Electronic Supplementary Information (ESI)

Effects of process parameters on the defects in graphene oxide/ polyaniline composite investigated by positron annihilation spectroscopy

Utpal Rana, P.M.G. Nambissan, Sudip Malik, Kuntal Chakrabarti*

Method for the synthesis of graphene oxide/ polyaniline composite

Graphene oxide (GO) was synthesized using powdered flake graphite (Sigma Aldrich, 12500, 500 mesh) by a modified Hummers method.[1] GO/PANI composites were prepared by the *in-situ* polymerization of aniline (Merck Chemicals) . Aniline (102mg, 1.1mmol) and different amount of GO were dispersed in water with constant stirring for one hour. After cooling the reaction mixture at 10^{o}C, aqueous solution of ammonium persulphate (Rankem Chemicals, $(NH_4)_2S_2O_8$, APS, 250 mg, 1.1mmol) was added drop wise over a period of 30 min and then the mixture was kept for 24 h at 268K without any disturbance. The resultant precipitate was filtered and washed ten times with copious amount of water and methanol to remove APS and oligoaniline. Finally, it was dried under vacuum for 24h to obtain GO/PANI composites. The weight amount of GO in five different composites were 51, 26, 10.2, 5.1, 1 mg and the relative abundance (x) of GO in composites are 66.7, 80, 90.9, 95.2 and 99%, which was calculated as the percentage by weight of PANI. In another set of samples, the one with x = 90.9% were prepared at three additional temperatures, viz. 283, 298 and 313K under all identical conditions.

Another set of sample was prepared where graphene, obtained by reduction of GO by hydrazine hydrate at 90^{o}C for 6h, was used instead of GO with x = 90.9% and temperature was 268K under all identical condition. This sample was prepared as reference.

Reference:

1. S. Ferrere, A. Zaban and B.A. Gregg, *J. Phys. Chem. B*, 1997, **101**, 4490.