The edge magnetism in graphene oxide

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The aim of presented study was to detect and investigate the nature of the magnetic ordering of graphene oxide. For this purpose we have coupled highly accurate SQUID magnetometry with electron paramagnetic resonance (EPR), which allows observations of ferromagnetic resonance (FMR) signal. We have studied graphene oxide "paper" –the bulk sample prepared by drying the graphene oxide suspension in air and the isolated graphene oxide flakes deposited on nanometric SiO2 powder and dried in vacuum. Analysis of the temperature dependence of the FMR/EPR spectra allows identification of paramagnetic and ferromagnetic contributions. The ferromagnetic signal can be removed by deep penetration of atmospheric oxygen into GO paper. It can be restored by sonification of GO water suspension resulting in breaking of GO flakes. Additionally, the magnetic susceptibility of GO flakes diluted in diamagnetic matrix and kept in vacuum is significantly higher than that of the GO paper. These results suggest that ferromagnetic response of GO is associated with unsaturated, ferromagnetically ordered dangling bonds on zig-zag edges.