Magnetic clusters on a surface of the partly hydrogenated graphene and chemically reduced graphene oxide

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Both, partly hydrogenated graphene and chemically reduced graphene oxide exhibit ferromagnetic response, but of different origin. Our study revealed that the FMR signals, corresponding to ferromagnetic properties, are accompanied by the narrow EPR line with g∼2. This signal is characterized by very strong temperature dependence of intensity. The intensity of the EPR signal corresponds to the magnetic susceptibility and decreases 540 times with temperature increase from 4.2 to 300 K. As the temperature dependence of the inverse susceptibility is not linear, the observed dependencies do not indicate ferromagnetic transition in the regions of low hydrogen density. The studied signals are of Lorentzian lineshape and their linewidth depends on the spin concentration, which gradually decreases with time. These features suggest that EPR signals in the studied materials are due to magnetic clusters created by absorption of hydrogen atoms. This interpretation is in accordance with the theoretical results showing instability of the sites with the single hydrogen atom absorbed.

We gratefully acknowledge the research grant from the Polish National Science Center: UMO-2016/21/D/ST3/00975.