

Structural and morphological transformation of thermally reduced graphene oxide at high temperatures

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This work is devoted to the study of thermally reduced graphene oxide (TrGO) [1, 2] after exposure to high temperatures (500 °C and 700 °C). The structure and morphology of the obtained samples were investigated using X-ray diffraction and Raman spectroscopy methods.

Analysis of the results shows that heating GO to high temperatures leads to a significant deformation of the carbon planes. As a result of thermal treatment, initially “flat” carbon layers undergo non-uniform distortion due to the presence of oxygen and metal–oxygen groups on the graphene surface, as well as an increase in defect concentration. The “flat” graphene layers become corrugated, which results in the appearance of an additional set of lattice planes with an identity period of $d = 5.06 \text{ \AA}$ on the X-ray diffraction pattern at 700 °C. This structural feature makes TrGO a promising candidate as a thin nanospacer or functional layer in multilayer systems, particularly for tuning periodicity and phase conditions in X-ray and neutron supermirror structures [3].

[1] A. V. Dolbin et. al., Applied Surface Science 361, 213–220 (2016). <http://dx.doi.org/10.1016/j.apsusc.2015.11.167>.

[2] A. V. Dolbin et. al., Low Temp. Phys. 46, 293 (2020); <https://doi.org/10.1063/10.0000701>.

[3] L. Mei et al., Optics Express, 31(18), 29768 (2023) <https://doi.org/10.1364/OE.497888>.

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