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Adsorption characteristics of nanographite oxide obtained from thermally expanded graphite

Elena Yu. Obraztsova, Marie N. Barshutina, Evgeny S. Bakunin, Artem V. Rukhov, Anna A. Shipovskaya and Alexey V. Shuklinov

Materials and methods

S1 Adsorbate.

Methyl orange (MO) (LenReactiv, Russia) was used as the adsorbate. The empirical formula and molecular mass of MO are $C_{14}H_{14}N_3NaO_3S$ and 327.33, respectively. Twice distilled deionized water was used to prepare all the solutions and reagents.

S2 Preparation of nanographite oxide.

Nanographite oxide (NGO) was obtained *via* an electrochemical exfoliation of thermally expanded graphite foil (Graphlex®, ZAO Unichemtech, Russia). The thermally expanded graphite (TEG) is distinguished by a worm-like shape of the particles and high porosity, so it possesses significant advantages over the conventional carbon plates when used as a raw material in the synthesis of NGO. Electrochemical exfoliation was carried out at a constant current (0.25 A cm^{-2}) in a two-electrode cell, wherein a Pt plate was used as a cathode, TEG foil was used as an anode, and a 0.15 M solution of sulfuric acid was used as an electrolyte. The obtained product was collected by vacuum filtration, repeatedly washed with distilled water to remove any residual salts until reach pH=7, and dried in a freezer dryer and vacuum oven for 24 h each.

S3 Structural characterization.

The morphology of the obtained NGO samples were characterized using a scanning electron microscope (SEM) (Carl Zeiss: Merlin, Germany). The FT-IR spectra of the NGO samples were recorded using a Fourier Transform Infrared Spectrophotometer (FT-IR) (Shimadzu, FTIR-8400).

S4 Batch adsorption studies.

The adsorption properties of NGO were investigated using aqueous solutions of methyl orange at various concentrations (1 to 6 mg dm^{-3}). NGO (4.5 mg) was added to MO solutions, the obtained mixtures were mildly sonicated for 30 min and kept for 24 h at room temperature for equilibration. Afterwards, the NGO was removed from the solutions by filtration, and the concentrations of remaining dye solutions were measured with an UV–VIS spectrophotometer (160-A, Shimadzu, Japan) using the calibration curve of absorbance against concentration at maximum absorbance $\lambda = 460$ nm.

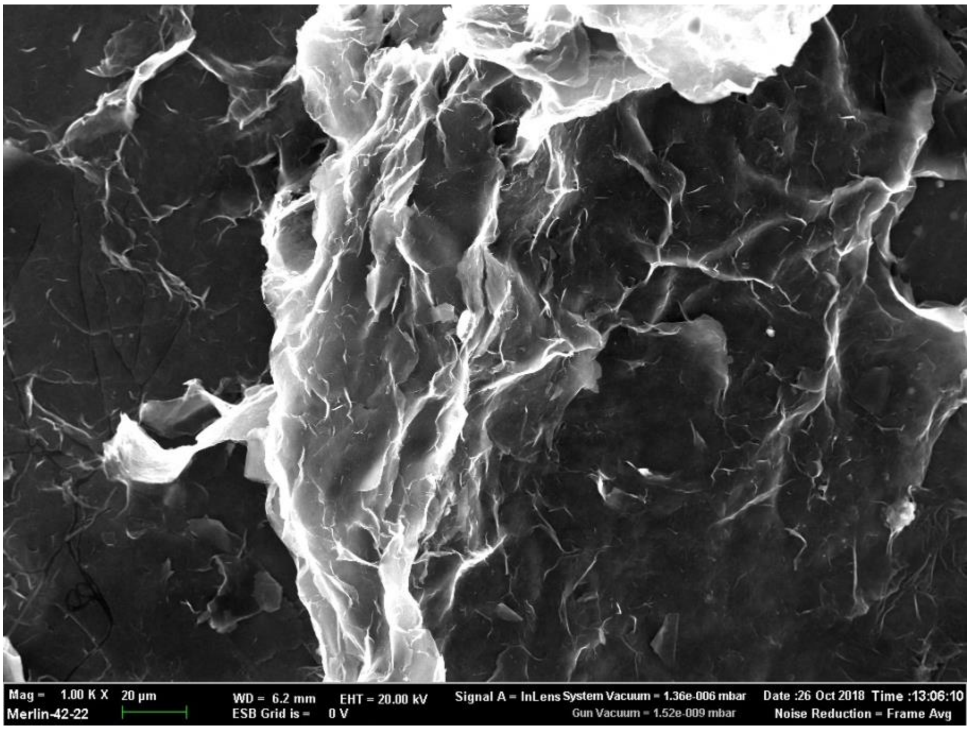

Figure S1 SEM image of NGO.

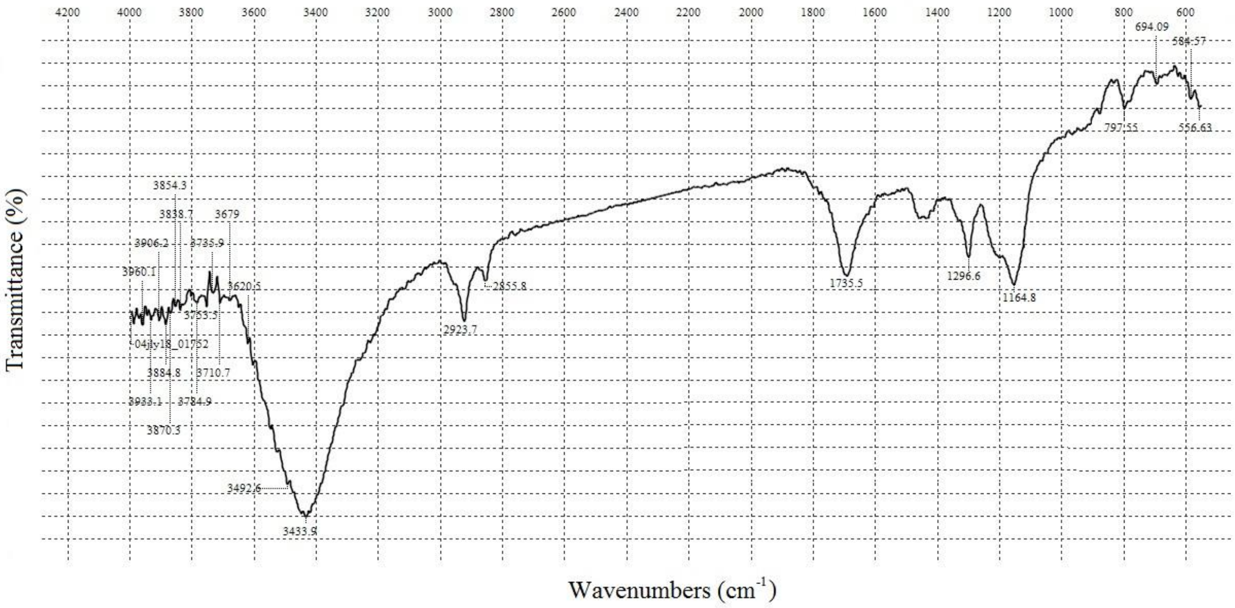

Figure S2 FT-IR spectra of NGO.