Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Graphene Oxide Sponge as Adsorbent for Organic Contaminants: Comparison with Granular Activated Carbon and Influence of Water Chemistry

Supplementary Information

Raphaela Allgayer[1], Nariman Yousefi[1,2], Nathalie Tufenkji[1]*

[1]Department of Chemical Engineering, McGill University,
3610 Rue University, Montreal, QC H3A 0C5, Canada

[2]Department of Chemical Engineering, Ryerson University,
350 Victoria Street, Toronto, ON M5B 2K3, Canada

* Corresponding Author. Phone: (514) 398-2999; Fax: (514) 398-6678; e-mail: nathalie.tufenkji@mcgill.ca

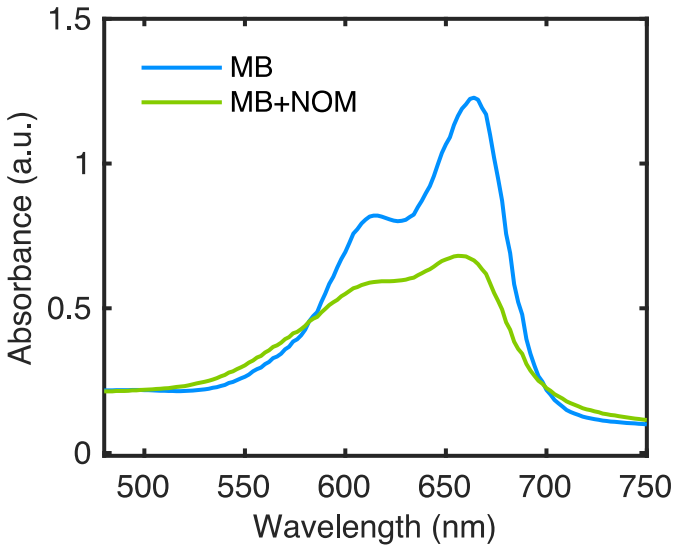

Figure S1. Characteristic absorption spectra of pure MB solutions and solutions that contain both MB and NOM.

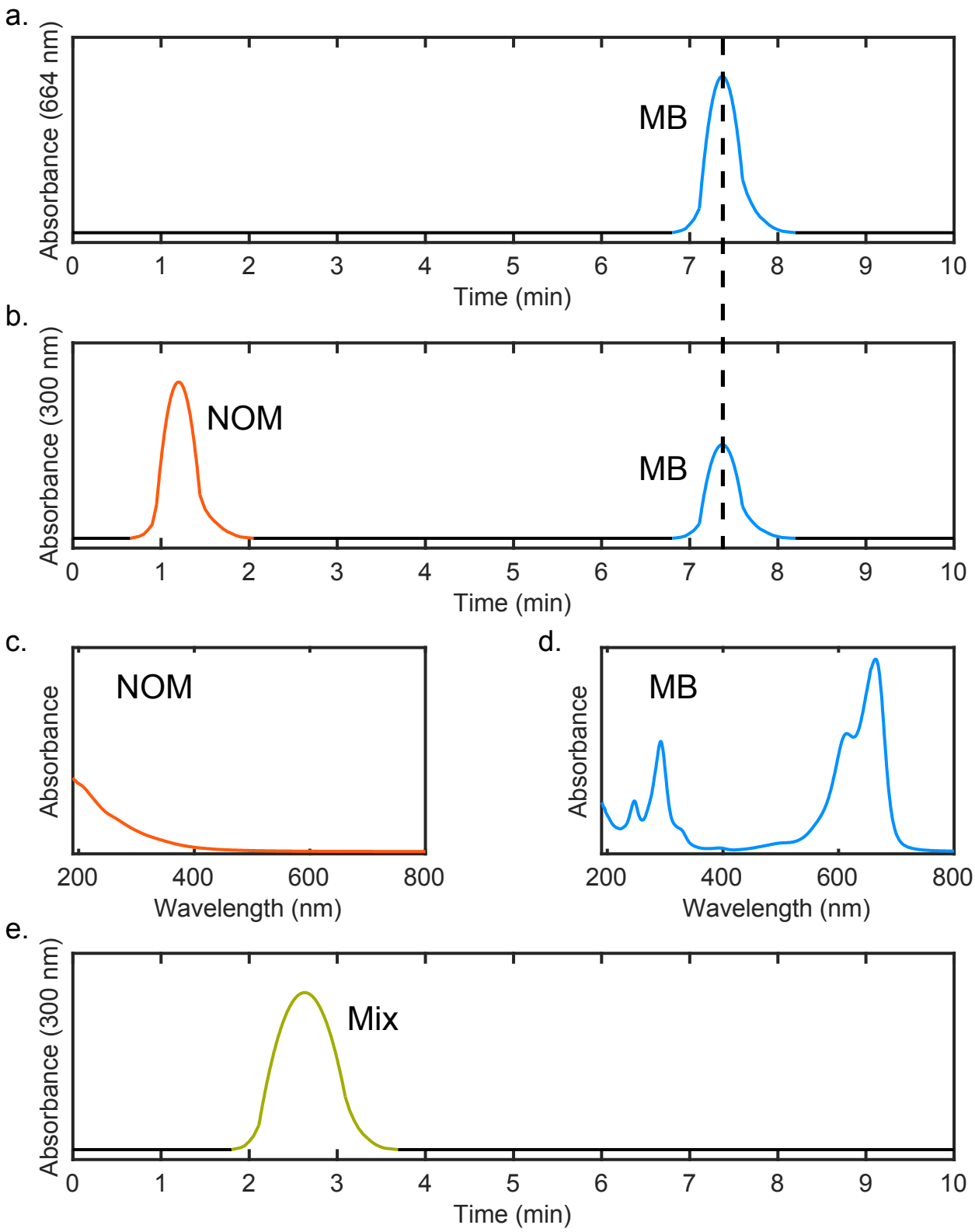

Figure S2. Typical chromatograms from the separation of MB and NOM at absorbances of (a) 664 nm and (b) 300 nm. The spectrum of the first elution peak corresponds to (c) the absorption spectrum of NOM and the second elution peak originates from (d) the characteristic absorption spectrum of MB.
(e) Chromatogram of the MB-NOM mixture without TFA.

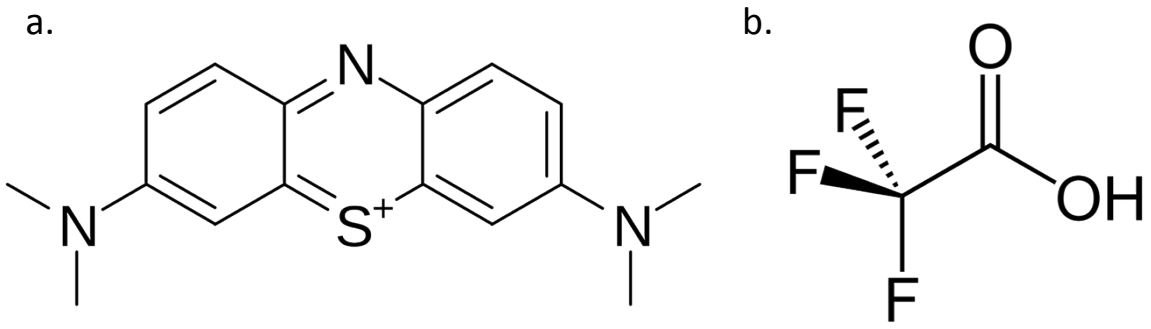

Figure S3. Molecular Structure of (a) Methylene Blue and (b) Trifluoroacetic Acid.

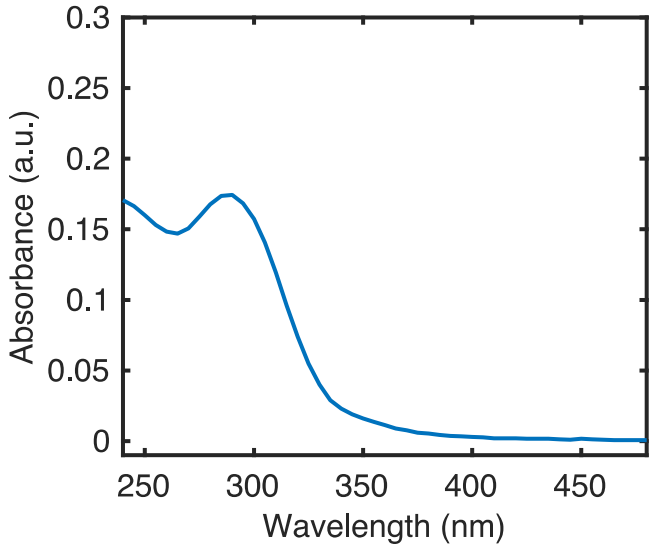

Figure S4. Absorption spectrum of the leachate of the rGO-CNC sponge after 24 h of shaking in the experimental set-up at 100 rpm. The absorption peak at 300 nm is characteristic for GO. However, as GO gets reduced during hydrogel formation, the peak should vanish.[1] Strongly reduced rGO does not exhibit the absorption peak at 300 nm. Potentially, the rGO sheets with a lower degree of reduction are not bound to the sponge as strongly as the more strongly reduced sheets, such that they leach out of the sponge over the course of the adsorption experiment. Further investigation is required to determine the oxidation state and the exact quantity of the leached (r)GO. Furthermore, even though the rGO-CNC sponge was thoroughly washed, a remainder of VC (absorption peak at 265 nm) or CNCs (absorption shoulder in the UV-range) might leach from the rGO-CNC sponge as a result of the mechanical stress during the adsorption experiment.

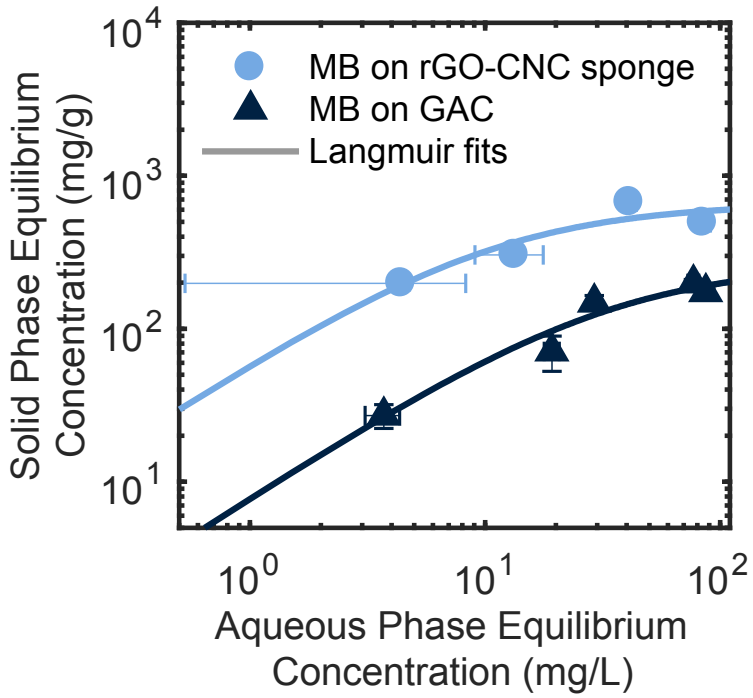

Figure S5. MB adsorption isotherms with the respective Langmuir fits (solid lines). The data corresponds to the data in Figure 3a, but a logarithmic representation is chosen to highlight the course of the isotherm. The error bars, which represent one standard deviation, are uneven because of the logarithmic display of the data.

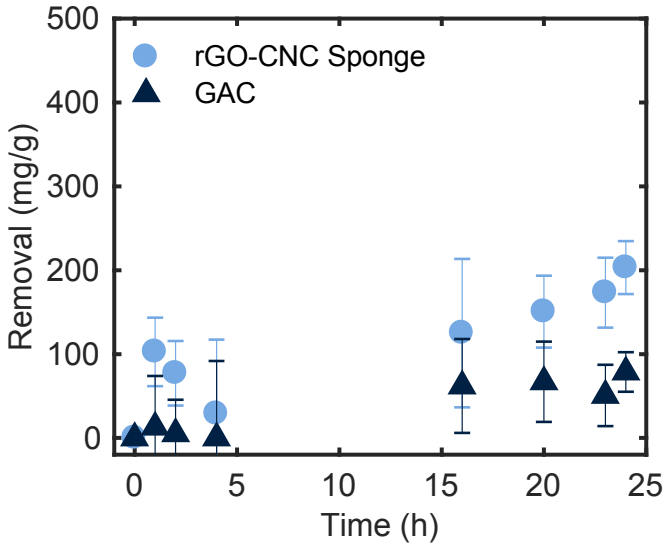

Figure S6. Long term kinetics of MB adsorption on the rGO-CNC sponge and on the Norit GAC. The initial MB concentration in solution is 30 mg/L, the ionic strength is 0.01 mol/L and the initial pH in solution is 6. As the MB removal on both adsorbents levels out after 16 h, the equilibrium removal was approximated as the MB removal after 24 h. The error bars represent one standard deviation.

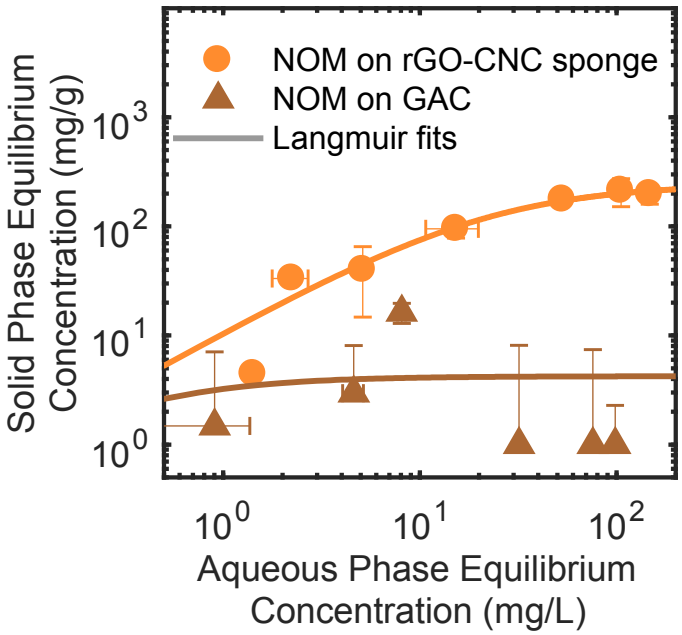

Figure S7. NOM adsorption isotherms with the respective Langmuir fits (solid lines). The data corresponds to the data in Figure 5a, but a logarithmic representation is chosen to highlight the course of the isotherm. The error bars, which represent one standard deviation, are uneven because of the logarithmic display of the data.

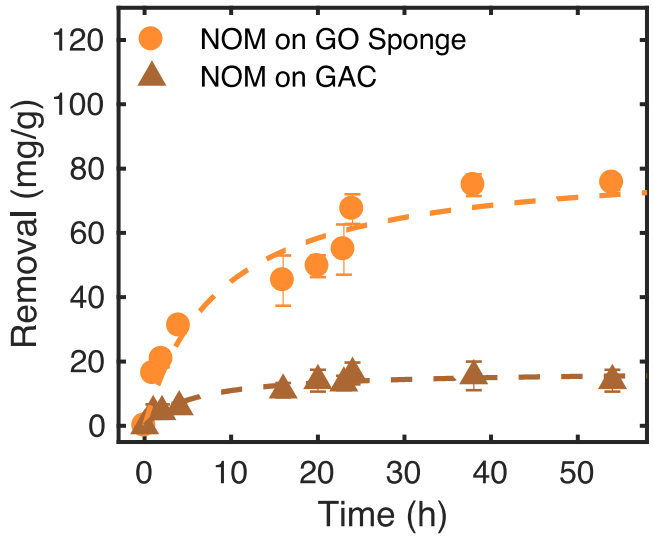

Figure S8. Long term kinetics of NOM adsorption on the rGO-CNC sponge and on the Norit GAC. The initial NOM concentration in solution is 10 mg/L, the ionic strength is 0.01 mol/L and the initial pH in solution is 6. The error bars represent one standard deviation.

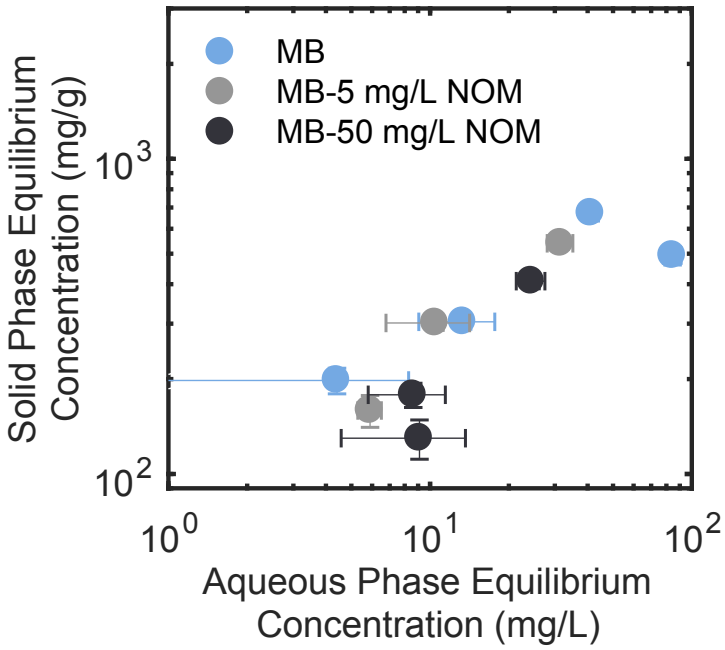

Figure S9. MB adsorption isotherm on the rGO-CNC sponge in the presence of NOM. The data corresponds to the data in Figure 5c, but a logarithmic representation is chosen to highlight the course of the isotherm. The error bars, which represent one standard deviation, are uneven because of the logarithmic display of the data.

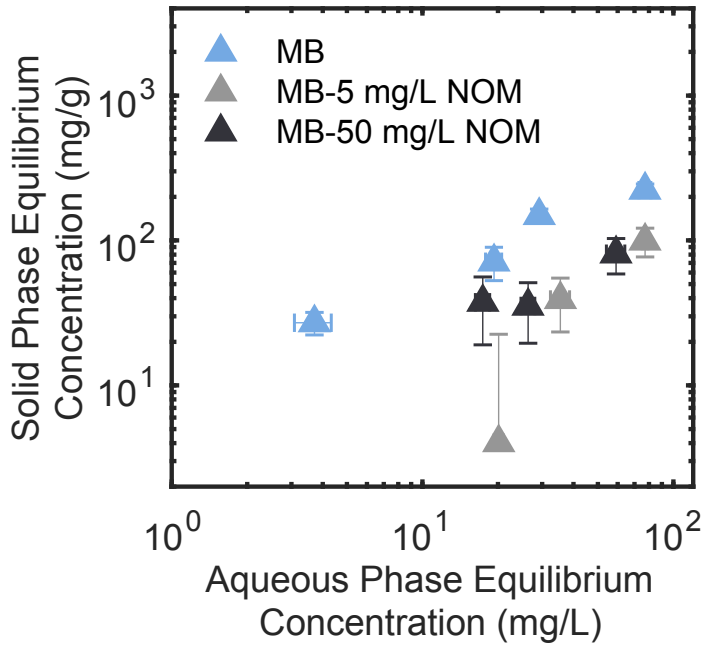

Figure S10. MB adsorption isotherm on the Norit GAC in the presence of NOM. The data corresponds to the data in Figure 5d, but a logarithmic representation is chosen to highlight the course of the isotherm and improve the visibility of the data. The error bars, which represent one standard deviation, are uneven because of the logarithmic display of the data.

1. J. Zhang, H. Yang, G. Shen, P. Cheng, J. Zhang and S. Guo, Reduction of graphene oxide via L-ascorbic acid, *Chemical Communications*, 2010, **46**, 1112-1114.