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The role of graphene oxide 'defects' on the adsorption of emerging water contaminants from water

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Academic and industrial interest is increasingly focusing on water treatments, especially on the removal of the "emerging contaminants" (ECs), identified as potential environmental threats.[1] The current water treatment technologies are not efficient in the removal of most of these contaminants from drinking waters and new materials and technologies are required. Due to their high surface area and multiple interactions pathways with organic molecules, graphene-based materials have shown great potential for water purification purposes. In particular, graphene oxide (GO) has shown high performance in the removal of some of these emerging contaminants [2], and the adsorption seems to be mainly related to surface interaction with the GO oxygenated groups. However, a clear understanding on the role of oxygenated groups on the adsorption mechanism is still missing. Here, we consider different types of GO having a different amount of C=O groups ('defects'): i) defective GO (dGO), Hummers GO (hGO), Brodie GO (bGO) [3]. Dedicated isotherms studies performed on a selection of ECs, allows us to estimate the adsorption performances of each specific pair substrate–molecule and to compare the maximum adsorption capacity of GO samples (i.e. Ofloxacin, dGO: 650 mg/g, hGO: 204 mg/g, bGO: 125 mg/g) to that of the Granular Activated Carbon (GAC; 95 mg/g), the industrial adsorption standard technology. The mechanism and role of defect on the adsorption performances will be discussed.

References

[1] N. Bolong, A. F. Ismail, M.R. Salim, T. Matsuura, Desalination, 239 (2009), 229-246.

[2] Wang, J.; Wang, S., Journal of Environmental Management 182 (2016), 620-640

[3] Boulanger, N.; Kuzenkova, A. S.; Iakunkov, et al.; ACS Applied Materials & Interfaces 12 (2020), 45122-45135.

Figures

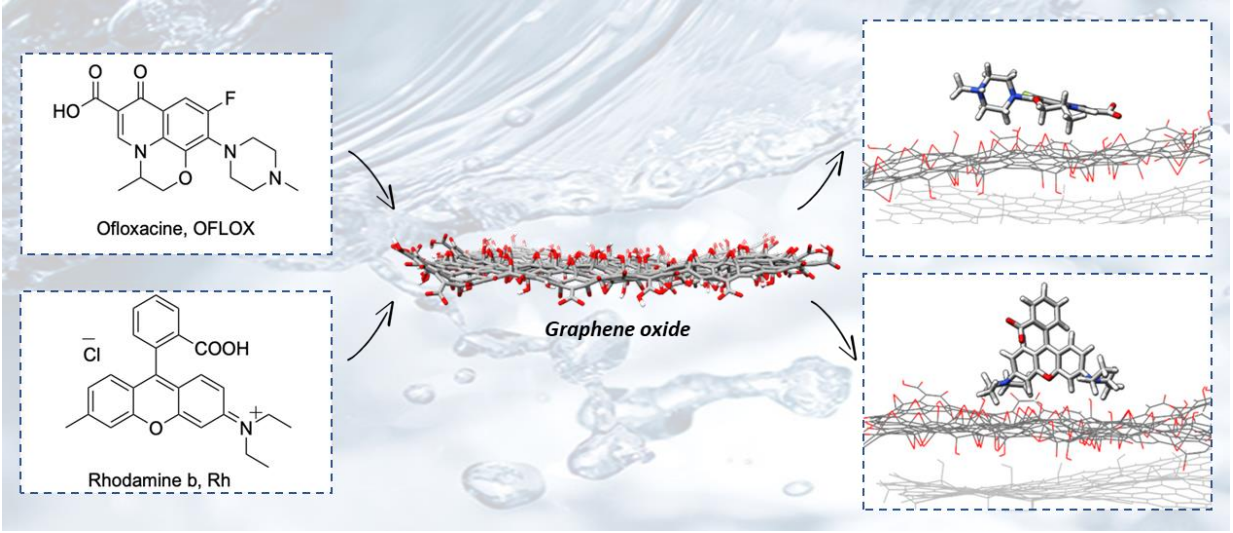

Figure 1: Adsorption of ECs (i.e. Ofloxacin and Rhodamine) on Graphene Oxide.