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High-performance synthesis of amino acids modified graphene oxide for adsorption of emerging contaminants in water

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Chemical modification of surface groups of graphene oxide (GO) has been recently exploited for promoting selective adsorption capability toward several classes of water pollutants, including emerging concern contaminants (ECs)[1]. Here we discuss a family of GO nanosheets covalently modified with different amino acids (Fig 1) and the study of their adsorption properties toward a mixture of selected contaminants, including pharmaceuticals, additives, and dyes. L-glutamic acid, L-methionine and L-lysine (GO-Glu, GO-Met and GO-Lys) were grafted on GO by epoxide ring opening reaction and purified by a scalable and fast synthetic and purification procedure based on microfiltration [2,3]. The obtained materials shows adsorption capacities toward bisphenol A (BPA), benzophenone-4 (BP4), and carbamazepine (CBZ) than those of standard GO and rGO, from 14 mg/g for pristine GO/BPA to 295 mg/g for GO-Lys/BPA. Molecular dynamics simulations highlighted higher interaction energies (-11.9 kcal/mol for GO/BP4 and -22.0 for GO-Met/BP4) for the modified GOs than unmodified GO, as a result of higher van der Waals and hydrophobic interactions between the contaminants and the amino acid side chains on the nanosheet surface4.

References

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[3] S. Mantovani, et al., Chem. Commun., 58, 9766, (2022)
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Figures

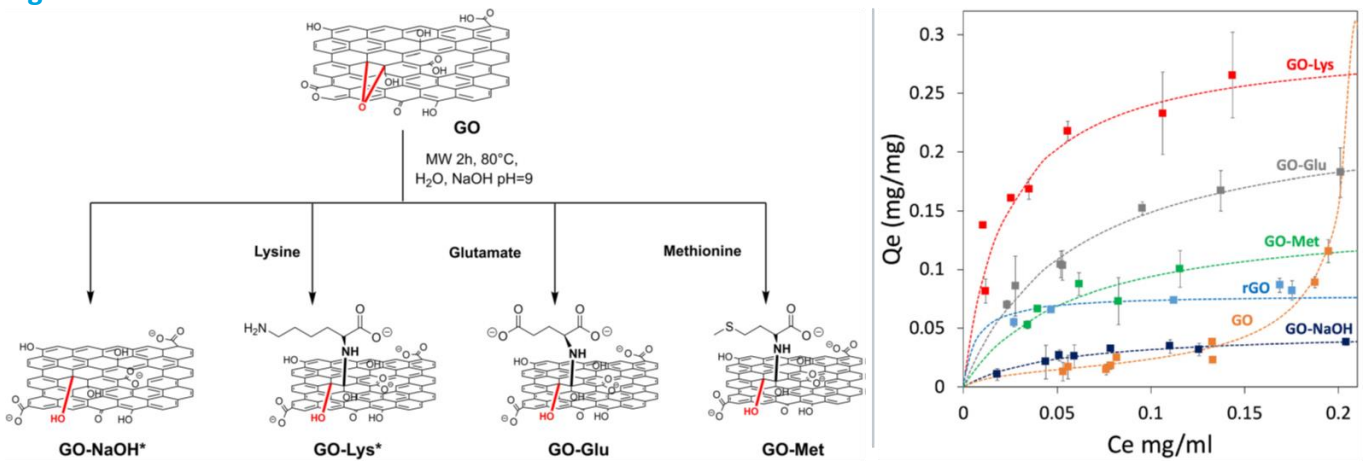

Figure 1: Synthetic pathway to amino acid-modified GOs (left) and adsorption isotherms toward BPA, BP4 and CBZ (right).