Amino acid modified graphene as smart material for glyphosate capture and electrochemical detection

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Analytical tools to assess the presence of organic pollutants in water are urgently required to map, prevent and, eventually, reduce the risks related to drinking water consumptions. The integration of sensor systems in the water distribution plans is attracting great interest due to the possibility of performing a continuous water monitoring. Although electrochemical sensors seem to be the most suitable solution for this application, the use of such analytical devices is limited by the fairly high concentration levels which they can detect. This prompted us to focalize our efforts in the development of materials capable to transduce the recognition event only after a massive adsorption of the target. Due to the recognized adsorption capability of graphene oxide (GO) derivatives[1] and the advantages relying in the use of these materials in electrochemical sensing,[2] we direct our attention in the synthesis and application of GO derivatives bearing aminoacidic residues (GO-AA), which are capable to strongly interact with selected organic contaminants.[3] Glyphosate (GLY) was chosen, among various organic contaminants, as a case of study for this study, due to the concerns related to its occurrence in several water compartments.

Adsorption and electrochemical tests demonstrated that GO-AA outperform the pristine unmodified material for GLY detection in water. Molecular dynamic simulations allowed us to ascribe the origin of this enhanced performance to the chemical interactions arising between the AA residues and GLY. Preliminary tests of the applicability of GO-AA for the real time monitoring of GLY in water are also reported.

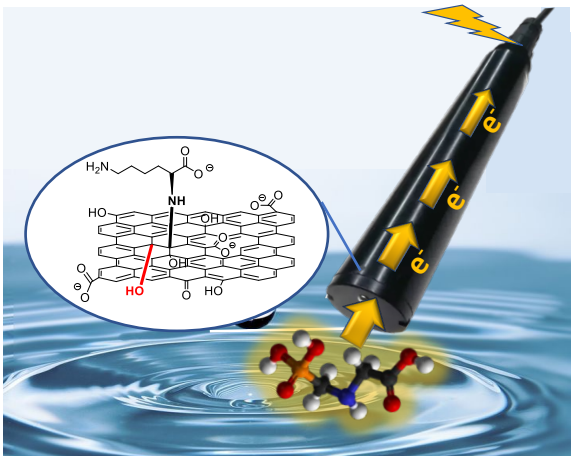

Figure 1: Schematic representation of the double role of GO-AA: adsorption, i.e. pre-concentration, and following electrochemical detection of chemical pollutants

References

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