Graphene based materials and technologies for advanced drinking water monitoring and treatment

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The last few years have seen the increasing occurrence of water contamination, including drinking water, by pharmaceuticals, personal care products, plastic and their additives among the other, that are not satisfyingly removed by conventional drinking water treatment technologies. [1] In some cases, as for the endocrine disrupting agents such as per and polyfluoroalkyl substances (PFAS) and bisphenol A (BPA), the eco and human toxicity has been demonstrated,[2] calling for the urgent development of new technologies for detection, early warning, and remediation of those contaminants.
I will report our recent results on the development of advanced graphene materials and technologies for drinking water monitoring and treatment.
Graphene based materials and approaches with high removal performances toward several classes of contaminants, including PFAS and outperforming in most cases, [3] granular activated carbon (GAC) the industrial sorbent benchmark, will be presented.
In addition, I will introduce chemically modified graphenes and related electrochemical sensors for fast and high sensitivity detection of molecular contaminants in drinking water through simultaneous capture and transduction enabled by the graphenic layer.
An overview of graphene chemical modification approaches,[4] processing into composites [5] and membranes, [6] applications in real environment and safety related aspects will be presented.

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Figures

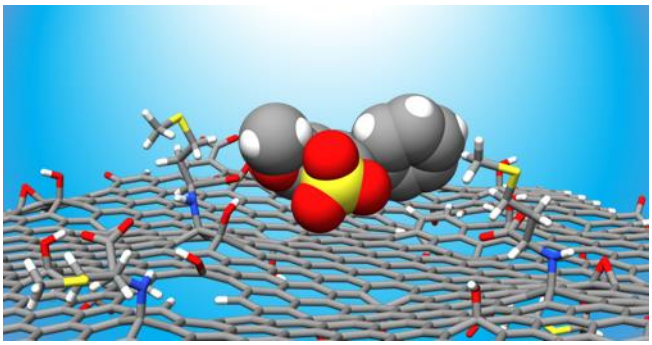

Figure 1: Recognition and capture of molecular contaminants in water by chemically modified graphenes.