Graphene oxide coating of hollow fibers for simultaneous adsorption&microfiltration in water purification

Antonio Bianchi[a], A. Kovtun[a], S. Khaliha[a], S. Mantovani[a], M. Zambianchi[a], L. Bocchi[b], M. Gazzano[a], M. Calvaresi[c], M. L. Navacchia[a], V. Palermo[a] and M. Melucci[a]

[a]Institute of Organic Synthesis and Photoreactivity (CNR-ISOF), Via Piero Gobetti 101, 40129, Bologna, Italy
[b]Medica spa, via degli Artigiani 7, 41036, Medolla (MO), Italy
[c]University of Bologna, via Zamboni 33, 40126, Bologna, Italy
antonio.bianchi@isof.cnr.it

The 6th Sustainable Development Goal of the United Nations aims to giving clean and safe drinking water to everyone on Earth[1]. In order to achieve it, it is necessary to develop innovative and highly efficient water purification technologies. In particular, the removal of a class of new contaminants, known as Emerging Contaminants (ECs) is strongly incentivized and investigated[2], due to the lack of effectiveness of standard purification systems in their removal from water. Graphene oxide (GO) is one of the most promising materials for this kind of application, thanks to its elevated superficial area and the abundance and versatility of interactions it can express. Its main drawback is the non-trivial recovery from water after treatment, which can lead to secondary contaminations. For this reason, GO-based 3D structures, such as foams, aerogels and membranes, are under intense study. We report[3] the synthesis of composite polyethersulfone-GO core-shell hollow fibers (HF-GO) from commercial microfiltration modules. Through simultaneous adsorption (thanks to intercalation between GO nanosheets) and microfiltration (thanks to PES cut off, 200 nm), these modules can remove up to 15 mg of ciprofloxacin, an EC, per gram of GO after few seconds of contact time (90% efficiency after 2500 L) and fully retain nanoparticles with 300 nm of diameter. Working mechanism is studied by XRD analysis and molecular modelling and the performance compared to granular activated carbon, the industrial standard.

References

[1] https://sdgs.un.org/goals
[2] P. Rosenfield, L. Feng, Risks of Hazardous Wastes, 2011;
[3] Kovtun, A.; Bianchi, A.; Zambianchi, M.; Bettini, C.; Corticelli, F.; Ruani, G.; Bocchi, L.; Stante, F.; Gazzano, M.; Marforio, T. D.; Calvaresi, M.; Minelli, M.; Navacchia, M. L.; Palermo, V.; Melucci, M., Core–shell graphene oxide–polymer hollow fibers as water filters with enhanced performance and selectivity. *Faraday Discussions* **2021,** *227* (0), 274-290.

Figures

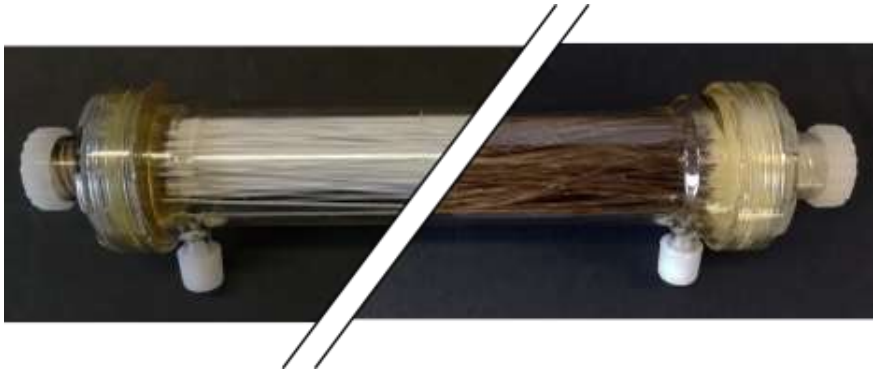

Figure 1. A hollow fiber microfiltration module before (left) and after (right) functionalisation with GO.