GRAPHIL FILTERS

MEMBRANE EXPERTISE™
MEDICA

About GRAPHIL filters

GRAPHIL is the **MEDICA** brand name of filters specifically designed for household **water treatment** and for **portable water purification devices.**

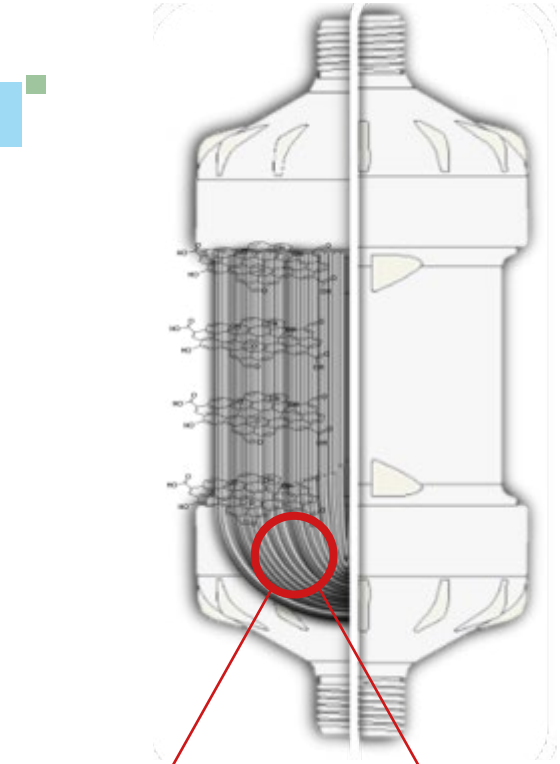
GRAPHIL filters have been developed by **MEDICA** thanks to a **funding from European Union** within the framework of **Graphene Flagship**.

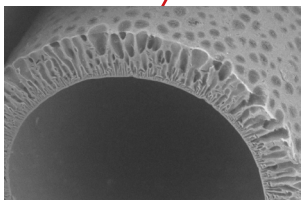
Funded by the European Union

GRAPHENE FLAGSHIP

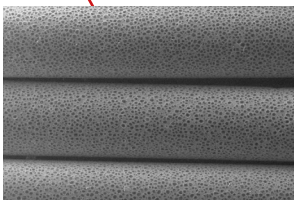
GRAPHIL filters are based on **GRAPHI**SULFONE, the new MEDICA brand name of polymer-graphene oxide hollow fibers with a **polymeric matrix** (polysulfone) and **graphene oxide sheets.**

GRAPHISULFONE simultaneously removes **microbiological contaminants** and molecular level **emerging concern contaminants.**





***GRAPHI**SULFONE SEM image*



***GRAPHI**SULFONE SEM image*

Adapted from «Zambianchi, M., et al. (2022). Graphene oxide-polysulfone hollow fibers membranes with synergic ultrafiltration and adsorption for enhanced drinking water treatment. Journal of Membrane Science, 658, 120707.»

The power of Graphene

The superior efficiency of water purification is obtained thanks to the combination of hollow fibers and Graphene Oxide, which provides **GRAPHI**SULFONE with a double mechanism of contaminants removal:

- **Micro/Ultrafiltration** (physical sieving mediated by the hollow fibers), which ensures the removal of microbiological contaminants;
- **Adsorption** by chemical interactions with Graphene Oxide, which ensures removal of pesticides, pharmaceuticals, perfluorinated compounds, disinfection-by-products, heavy metals.

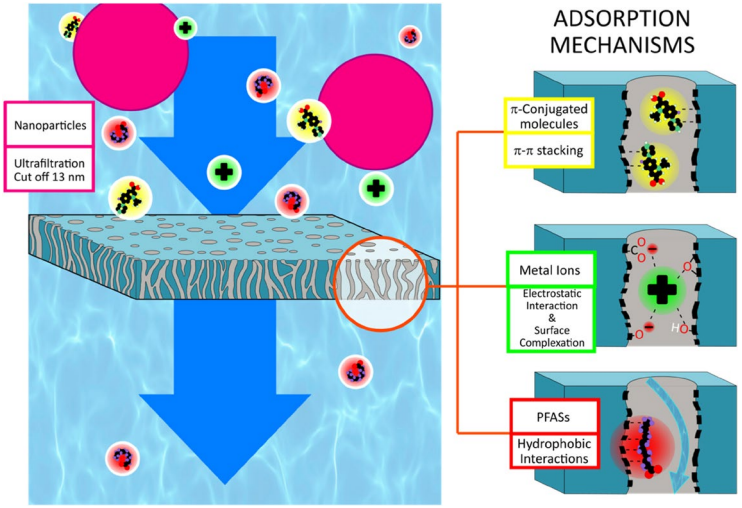


Image from «Zambianchi, M., et al.. (2022). Graphene oxide-polysulfone hollow fibers membranes with synergic ultrafiltration and adsorption for enhanced drinking water treatment. Journal of Membrane Science, 658, 120707.»

Higher water purity

- Bacteria
- Virus
- PFAS
- Heavy metals
- Antibiotics
- Pesticides
- Microplastics

Higher removal efficiency of contaminants

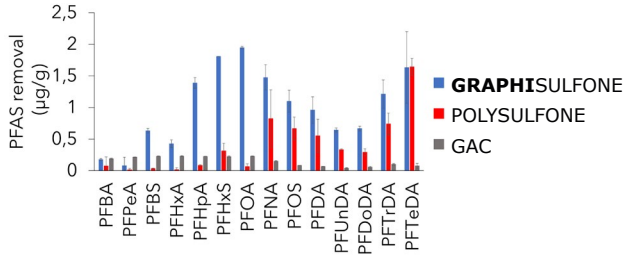
HEAVY METALS	GRAPHISULFONE	GAC *(granular activated carbon)*
Pb	100% - 80%	80% - 70%
Cu	100% - 60%	80% - 60%
Cr(III)	50%	40%

Consiglio Nazionale delle Ricerche

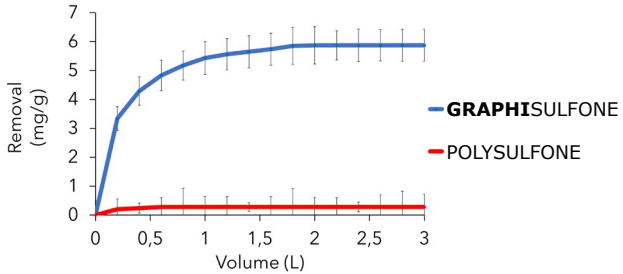
Performance data have been generated by CNR – Consiglio Nazionale delle Ricerche of Bologna (Italy) ref. To Dr. M. Melucci

Images adapted from «Zambianchi, M., et al.. (2022). Graphene oxide-polysulfone hollow fibers membranes with synergic ultrafiltration and adsorption for enhanced drinking water treatment. Journal of Membrane Science, 658, 120707.»

PFAS

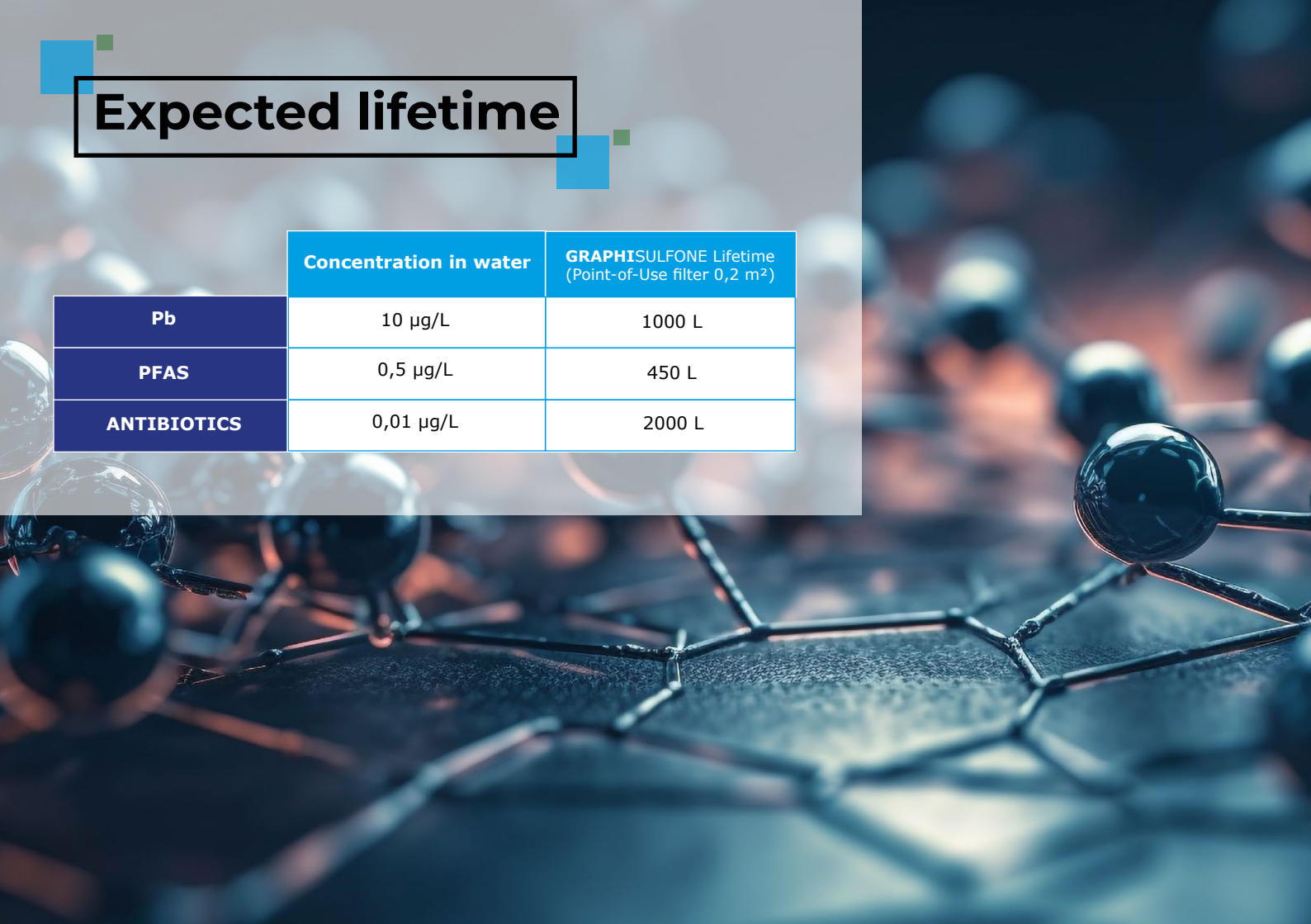


ANTIBIOTICS



Expected lifetime

	Concentration in water	**GRAPHI**SULFONE Lifetime (Point-of-Use filter 0,2 m²)
Pb	10 µg/L	1000 L
PFAS	0,5 µg/L	450 L
ANTIBIOTICS	0,01 µg/L	2000 L



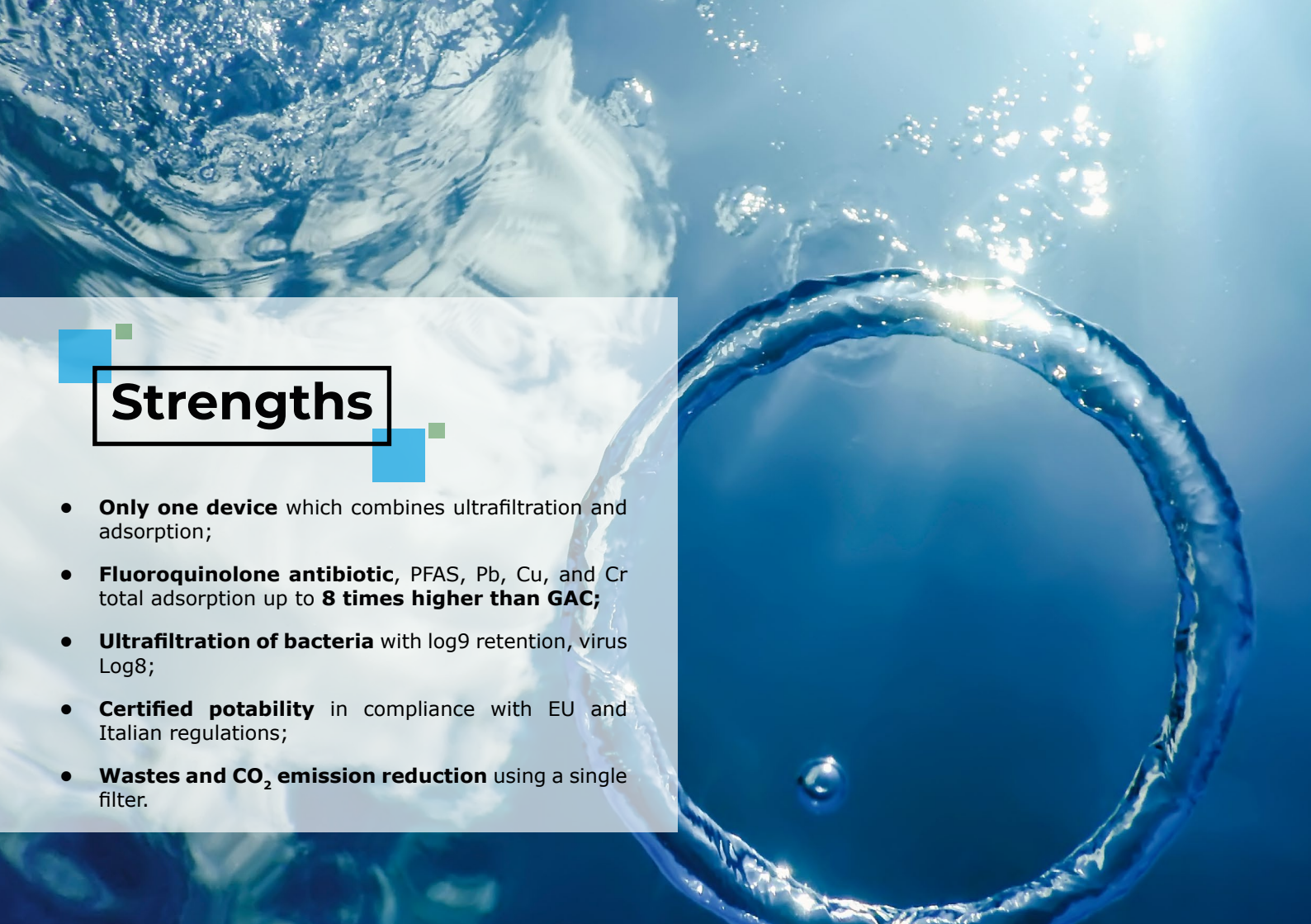
Absolute safety

Tests for the detection and quantification of graphene oxide in water samples at ultra-trace levels using surface-enhanced Raman spectroscopy (SERS – ref. to Dr. E. Vasquez UCLM Spain), show that **GRAPHI**SULFONE causes absolutely **no release of graphene in the water** also under high stress conditions (state of the art limit quantification 0,1 ppb).

GRAPHIL filters are absolutely safe and meet all drinking water quality requirements

	Fed tap water	Measure	DWD (EU) 2020/2184 limits*	Italian D.Lsg. 31/01** limits
Cr	<3,0 µg/L	0,6 µg/L	25 µg/L	50 µg/L
Pb	<3,0 µg/L	0,5 µg/L	5 µg/L	10 µg/L
Cu	<0,01 mg/L	<0,01 mg/L	2,0 mg/L	1 mg/L
Hg	<0,1µg/L	<0,1µg/L	1,0 µg/L	1,0 µg/L
Ni	<3,0 µg/L	0,5 µg/L	20 µg/L	20 µg/L
Arsenic	<1,0 µg/L	<0,1 µg/L	10 µg/L	10 µg/L
Nitrites	<0,5 mg/L	0,07 mg/L	0,50 mg/L	0,50 mg/L
Nitrates	31 mg/L	3,21 mg/L	50 mg/L	50 mg/L
Pesticides (total)	<0,02 µg/L	<0,02 µg/L	0,50 µg/L	0,50 µg/L
PAH	<0,10 µg/L	<0,002 µg/L	0,10 µg/L	0,10 µg/L
Enterococci	0 UFC/100 ml	0 UFC/100 ml	Completely free	Completely free
E-coli	0 UFC/100 m	0 UFC/100 m	Completely free	Completely free

**https://eur-lex.europa.eu/EN/legal-content/summary/drinking-water-essential-quality-standards.html*
*** https://www.gazzettaufficiale.it/eli/id/2001/03/03/001G0074/sg*



Strengths

- **Only one device** which combines ultrafiltration and adsorption;
- **Fluoroquinolone antibiotic**, PFAS, Pb, Cu, and Cr total adsorption up to **8 times higher than GAC;**
- **Ultrafiltration of bacteria** with log9 retention, virus Log8;
- **Certified potability** in compliance with EU and Italian regulations;
- **Wastes and CO_2 emission reduction** using a single filter.

Target applications

The extremely interesting qualities of the filters ensure **higher water purification efficiency with maximum safety**, in total absence of leakage of any graphene-derived material in the purified water.

The filters are recommended for different applications, where the removal of emerging concern contaminants (revised in the Drinking Water Directive EU 2020/2184) from water is needed in:

- **Point-of-Use systems;**
- **Point-of-Entry systems;**
- **Portable-Water-Purifier systems** (outdoor and emergency contexts).

MEDICA Water Purification Unit

From the know-how and technological expertise gained in the blood filtration field, **MEDICA's Water Division** now manufactures and distributes **unique hollow-fibre membranes for water purification.**

All production takes place in special **ISO 14644 compliant cleanrooms,** 100% tested in accordance with strict protocols of the **ISO 9001 and ISO 13485 internal quality system, biocompatibility per EN ISO 10993.**

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