ZeroPM

Zero pollution of Persistent, Mobile substances

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Fact sheet

Passive sampling for PMT/vPvM substances in water

Protecting Water Quality from Persistent, Mobile, and Toxic Pollutants

Passive sampling offers a reliable, low-maintenance, and time-integrated approach to monitor pollutants that are often missed by traditional methods. Developed and field-tested by the ZeroPM project, these samplers provide a cost-effective tool to support regulatory compliance and protect drinking water resources.

Why Choose Passive Sampling?

While "grab sampling" (taking a single bottle of water) provides a snapshot, passive sampling (PS) acts like a continuous recording device for water quality providing the following advantages:

- Time-integrated monitoring: PS captures average concentrations over days or weeks, smoothing out fluctuations.
- Superior detection: It acts as an in-situ pre-concentrator, making it often possible to quantify substances that occur below the detection limits of standard bottle sampling based methodologies.
- Catching "spikes": Mobile substances often enter water in pulses (e.g. after rain events or industrial discharge). PS continuously samples, ensuring these events are recorded.
- Cost-effective and low maintenance: No power, no pumps, and no moving parts. Just deploy and retrieve.

What are PMT/vPvM substances?

PMT (Persistent, Mobile, and Toxic) and vPvM (very Persistent, very Mobile) substances are pollutants that present unique challenges:

Persistent: They do not easily degrade; once released, they accumulate in the environment over time.

Mobile: Highly soluble in water. They pass through soils, sediments, and traditional wastewater treatment plants, moving quickly into drinking water resources.

Toxic: They pose significant long-term risks to both human health and aquatic ecosystems.

Target substances of concern

ZeroPM focuses on substances that are difficult to monitor using traditional methods:

PFAS: Including ultra-short chain PFAS.

Benzotriazoles: Widely used as corrosion inhibitors.

Triazines and melamine: Common in industrial and agricultural applications.

What has ZeroPM Achieved?

The ZeroPM project has bridged the gap between lab research and real-world water management by:

1. Sampler innovation: Developed a robust, stain-less-steel mesh POCIS (Polar Organic Compound Integrative Sampler) specifically tuned for PM substances.
2. Calibrated uptake: Provided clear data on how chemicals transfer from water into the sampler, allowing for quantitative results (not just "present/absent").
3. Confirmed performance: We successfully deployed these samplers in drinking water and wastewater treatment effluents for periods of 7 to 10 days, effectively sampling the equivalent of 1 Liter of water without the logistics of transporting heavy bottles.

The Legislative Context: Closing the Gap

Regulatory requirements are becoming stricter. Passive sampling helps water managers meet the requirements of:

- Water Framework Directive (WFD): Essential for comparing water quality against Environmental Quality Standards (EQS) where annual averages are required.
- Revised Urban Wastewater Treatment Directive (UWWTD): Introduces "Extended Producer Responsi-bility" and the need to monitor micropollutants (like benzotriazoles, PFAS and pharmaceuticals) not necessarily removed substantially during conven-tional treatment.
- Drinking Water Directive: Provides the sensitivity needed to ensure "forever chemicals" stay below strict health-based limits.

Passive sampling can provide the evidence base needed for regulatory compliance.

Passive sampler testing at wastewater treatment plants in Norway and Greece

Technical Spotlight: The ZeroPM Sampler

The Design: A new configuration of the POCIS using metal rings to secure specialized sorbent layers (e.g. WAX or HLB discs).

The Innovation: Uses a fine stainless-steel mesh as a protective membrane. This protect the sorbent disc while allowing water-bound chemicals to pass through freely.

Efficiency: A 40 cm2 surface area guarantees sampling rates of approximately 100 mL d-1.

The Way Forward

ZeroPM is putting these tools into the hands of practi-tioners. By using calibrated, field-tested passive samplers, drinking and waste water works can move from reactive monitoring to proactive source identification and trend analysis with passive samplers.

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