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Passive sampling of polar organic compounds: application to the Seine River comparing combinations of sorbents through target and non-target screening

C. Richer^{1*}, F. Alliot¹ and T. Thiebault¹

¹METIS, Sorbonne Univ, CNRS, EPHE, PSL Univ, UMR 7619, F-75005 Paris, France

camille.richer@sorbonne-universite.fr

As environmental issues become an increasingly widespread concern, a wide variety of organic contaminants, particularly in water and wastewater, require attention. Monitoring these pollutants flows within environmental compartments allows for estimating population use or exposure to various substances. While composite automatic sampling remains the gold standard of environmental quality assessment, passive sampling presents a valuable alternative for tracking water quality, offering cost-effective time-averaged concentration data, and lowering limits of quantification. Despite recent innovations related to passive sampling devices [1], few studies analysed the impact of sorbent type or their combination with the aim of quantitatively accumulating a large diversity of compounds, and particularly the most hydrophilic ones [2, 3].

This study will explore various types of sorbents to identify the most effective combination for the target and non-target screening focusing on hydrophilic and polar organic compounds. Several combinations of anion exchange (WAX), cation exchange (WCX), and neutral sorbents (HLB) with Polar Organic Chemical Integrative Samplers (POCIS) will be evaluated. The samplers will be deployed in the Seine River in Paris, France, with performance reference compounds (PRC) added to each device prior to deployment. To assess the kinetic parameters of the sorbent mixtures and determine the sampling rates (Rs) for the target molecules, passive samplers will be exposed for varying periods—1, 2, 4, 7, 10, and 14 days. Composite samples will be collected from the same location at each interval. After extraction, the samples will be analysed using LC-MS/MS for target screening and HRMS (Q/TOF) for non-target screening.

The results will provide valuable insights into the performance of different POCIS sorbents in capturing polar compounds and will help to determine the Rs for each configuration. This will allow us to identify the most efficient setup for accumulating a broad range of dissolved organic compounds. Ultimately, these findings will contribute to enhancing sampling techniques, potentially enabling the application of these devices for wastewater-based epidemiology (WBE) through both target and non-target screening, providing a means to monitor the composition of raw wastewater.

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