Accelerated UV ageing was applied to mimic environmentally relevant processes, with the precipitated particles being photo-oxidized and subsequently characterized by FT-IR and zeta-potential measurements. Pristine particles showed strong agglomeration tendencies, whereas the UV-aged materials exhibited enhanced colloidal stability in aqueous systems, with zeta potentials below –30 mV at pH 7, significantly reducing their propensity to cluster. A concept for producing pristine MNP particles containing polymer additives is furthermore introduced.

This study ultimately provides two key advancements: (1) a precipitation-based route for generating polymer-diverse reference materials for MP/MNP characterization, and (2) an ageing procedure that enhances environmental relevance by modifying particle surface chemistry and dispersion behavior.

3.18.P-Mo192 Towards fit-for-purpose monitoring of microplastics

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The past 20 years of research has left us in no doubt that microplastics are ubiquitous across the globe. However, whilst we are not lacking in data, we are limited in generalising insights from the extensive observational studies to date. Uncertainty is inherent to the measurement of any chemical. Whilst not unique to microplastic research, it is proving particularly challenging when communicating the risks of microplastic emissions. Standardisation of measurements is often cited as a solution. However, standardisation can only occur once the field has matured sufficiently to guide which of the available methods can deliver relevant data and meet the needs of the many stakeholders who will rely on these measurements.

Many approaches have been used to measure microplastics in the environment. These range from the relatively cheap, looking for easy to spot large particles, to more expensive analyses, targeting challenging particles only a few microns in size, or identifying polymers themselves. No single method is quantitative of microplastics across their entire diversity of size, shape and chemistry. However, if we consider specific monitoring scenarios, we can begin to identify and develop methods which are “fit-for-purpose”.

Any candidate method consists of a series of steps: sample collection, preparation, analysis and interpretation. There is variation associated with each of these steps, which in combination establishes the total uncertainty. When considering wide scale monitoring, the suitability of candidate methods can be considered a balance between the accuracy and precision of the data generated (the “uncertainty”), versus the costs, throughput and readiness of these methods for deployment at scale.

Here, we present a framework to identify fit-for-purpose monitoring for microplastics (UKWIR, EQ/01/A/279). Taking the hypothetical scenario of national monitoring for microplastics in wastewater effluent, we show how uncertainty, sample number, confidence and costs are linked and can be combined in an evaluative framework, to select suitable methods to develop or deploy at scale. This framework would allow candidates to be ranked, cost efficiency to be considered and recommendations for targeted research to reduce uncertainty or validate specific elements of the method(s) to be identified. In this way, the framework acts as a harmonised, structured approach, applicable to many scenarios, to support the development of fit-for-purpose monitoring.

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3.18.P-Mo194 Assessing Sampling Effort Needed to Detect Microplastic Declines in the Scheldt Estuary for Policy Support

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Monitoring plastic pollution in estuarine environments is complicated due to high natural variability and multiple interacting physical, chemical, and biological processes affecting transport and retention. In the Scheldt

Estuary in Belgium, tidal dynamics, freshwater discharge, rainfall, sediment resuspension, vegetation, organic matter, and industrial activity introduce variability that can obscure temporal trends. Historical accumulation and burial-resuspension cycles of older plastics further complicate distinguishing new pollution. Following recent policy measures to reduce microplastic emissions, the PLASTFLOW project (2024–2025) aimed to update microplastic abundance estimates and evaluate the sampling effort required to detect policy-driven changes. Building on a 2020–2022 baseline study, sampling campaigns were conducted across eight estuarine sites during different seasons, collecting surface and water-column samples at multiple depths. Preliminary results confirm previously identified accumulation zones, particularly upstream of Doel and in the Antwerp region, with surface concentrations ranging from 25–28 particles/m³ and water-column concentrations from 93–122 particles/m³. Downstream locations generally exhibited lower concentrations, though Zeebrugge showed elevated water-column levels likely influenced by coastal inputs or dredge disposal. To inform monitoring design, a power analysis is currently being performed using observed variability to determine the number of samples per estuarine segment and season needed to detect policy-relevant changes ($\alpha = 0.05$, power = 0.8). Initial observations suggest substantially higher sampling intensity than currently implemented is required, which emphasizes the influence of both spatial and temporal variability on monitoring outcomes. By combining updated concentration data with statistical power assessment, PLASTFLOW will provide guidance for robust long-term monitoring frameworks, enabling reliable evaluation of mitigation efforts under the EU Green Deal's Zero Pollution Action Plan.

3.18.P-Mo195 Minimizing Biogenic Interference in Microplastic Quantification: Evaluation of Digestion Protocols and Counterstaining Strategies

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Microplastics characterization in organic waste remains a major analytical challenge due to the complexity of the matrix. The main issues arise from the high loads of biogenic materials, which can persist through multiple sample preparation steps. While chemical digestion has been studied to reduce organic content in various environmental matrices, complete removal has not been achieved without compromising polymer integrity. Residual natural particles can exhibit optical properties similar to those of plastics, leading to a substantial overestimation during microscopic-based quantification. In this study, we evaluated the efficiency of multiple digestion protocols for organic waste and introduced a subsequent two-step staining procedure to better visualize and distinguish microplastics from inorganic and biogenic particles. Since Nile red can fluorescently stain both plastic and certain natural particles, a counterstaining step using a water-soluble dye was introduced to mask and suppress the fluorescence signal from the biogenic interferences. The proposed workflow aims to minimize matrix-derived interferences and improve the reliability of microplastic analysis in organic waste.

3.18.P-Mo196 Development of a Portable Hollow-Fiber System for Sampling and Quantifying Microplastics Larger Than 1 µm

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Microplastics (MPs) in treated drinking water have emerged as a regulatory concern, particularly in the European Union where routine monitoring is mandated, and in California where tap-water monitoring guidelines have recently been proposed. Although these frameworks outline recommended sampling and analytical approaches for both raw and treated water, their implementation remains impractical. Current protocols require prolonged sampling and the use of large, costly concentration systems capable of processing several hundred liters of water in situ, presenting significant technical and logistical barriers. Moreover, multiple studies suggest that MPs detected in tap water may originate from post-treatment contamination within distribution systems rather than from water purification facilities, underscoring the need for point-of-use measurements. To accurately evaluate human exposure and associated health risks, reliable and scalable methods are needed to quantify MPs—including their concentrations, size distributions, and polymer chemistries—directly at consumer endpoints.
Here, we present a newly developed portable hollow-fiber concentration system (Mitsubishi Chemical Cleansui Corporation) designed for rapid sampling of MPs >1 µm in tap water. The system is compact and installation requires only attachment to a standard faucet, comparable to operating a household shower head. Sampling several hundred liters of tap water can be completed within 30 minutes automatically, and MPs are retained within a dedicated concentration chamber integrated into the shower-head unit. The retained fraction is subsequently digested using 30% hydrogen peroxide and further concentrated onto a 1 µm silicon membrane filter. Identification and quantification are performed using micro-Raman spectroscopy coupled with imaging-based particle recognition.