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Separation of microplastics and sediments: a comparative analysis of extracting methods

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Introduction

Plastic waste and the products of its fragmentation (microplastics or "MPs", <5mm) pose a global and persistent threat to all ecosystems due to their ease of ingestion by a wide variety of species (Thompson, 2015). Monitor the occurrence of MPs is a necessary step to perform accurate risk assessment and elaborate prevention and remediation actions.

However, for complex environmental matrices, such as sediments, the quantification of MPs is particularly challenging. MPs have to be separated from sediments prior to be analyzed. A broad diversity of protocols have been proposed in order to achieve this essential operation. Among them, density separation methods have been extensively used.



VALSE is an interreg project (France - Wallonia - Vlaanderen) which studies the possibilities of valorisation of sediments and excavated soil.

Tests

In this study, we compared the extraction efficiency of 6 solutions (water, oil, water+oil, NaCl, NaCl+oil and NaI) in combination with to 3 agitation methods (manual stirring, centrifugation and air insufflation). Tests were performed with low (PE and PE-ABS) and high (PET, PA and PES) density polymers of four shapes (pellet, fragment, fiber and foam) for two kind of sediments (coarse and fine).

Results

Overall, methods and sediment features did not influence drastically separation efficiencies. Low density polymers were relatively well extracted with all solutions, at the exception of oil alone. High density polymers were more significantly recover with NaI. Finally,

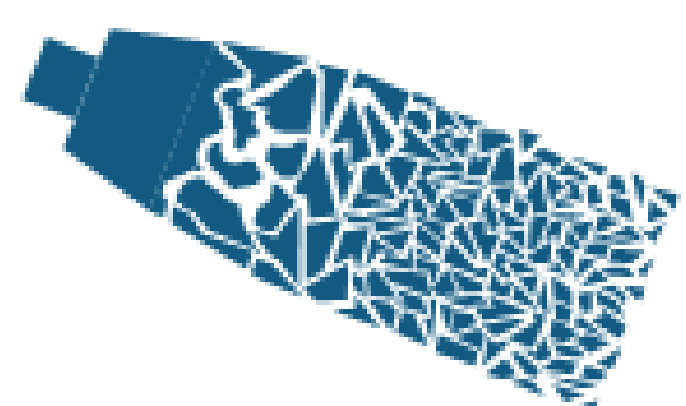
consecutive extractions improved MP recoveries. According to this study, a 5 steps extracting procedure with a NaI solution at 1.8 g/L seems to be the most promising process.

Materials



Sediments

+



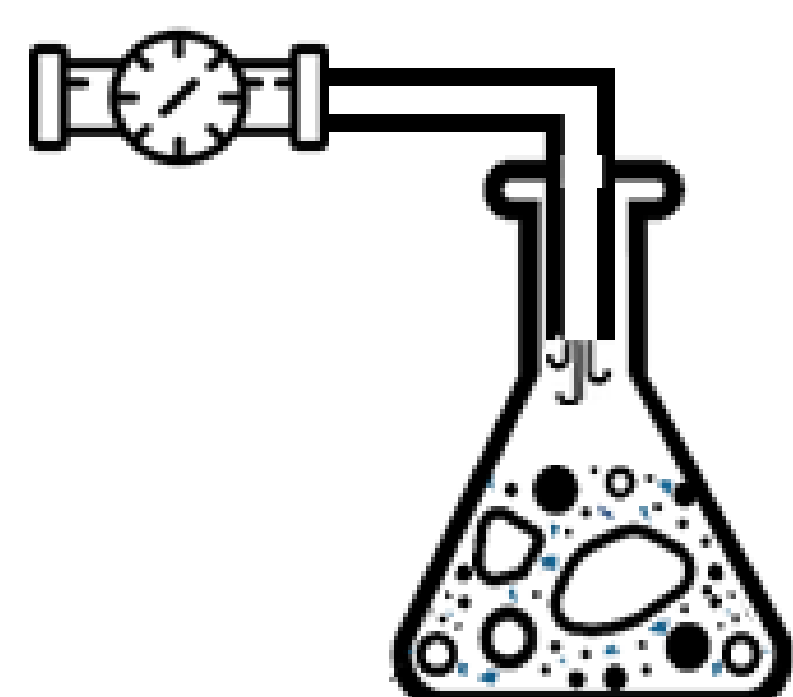
Microplastics

+

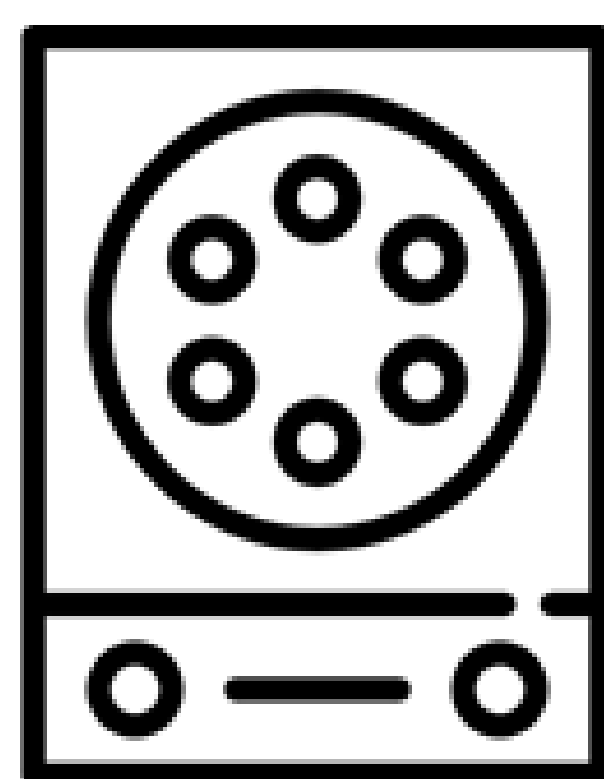


Extracting
solutions

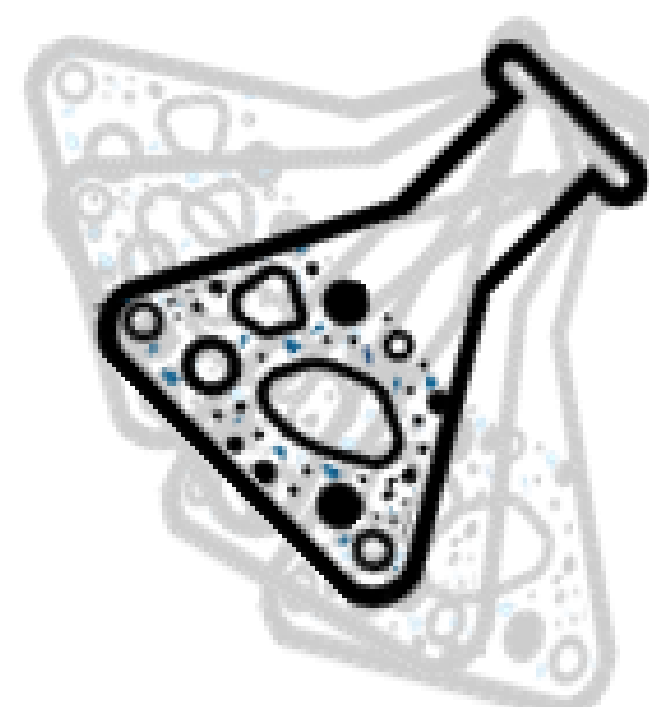
Separation methods



Air insufflation



Centrifugation



Hand-stirring

Extraction rate (%)

