Fractionated filtration for isolation of microplastics from bottled water

Natalia A. Gutierrez Andrade*†[1], Luca Maurizi[2], Tatevik Chalyan[1], Wendy Meulebroeck[1], Jes Vollertsen[3], and Heidi Ottevaere[1]

[1]Vrije Universiteit Brussel and Flanders Make – Vrije Universiteit Brussel and Flanders Make, Department of Applied Physics and Photonics, Brussels Photonics, Pleinlaan 2, 1050 Brussels, Belgium, Belgium

[2]Aalborg University, Department of Civil Engineering, Division of Water and Environment – Thomas Manns Vej 23, 9220 Aalborg Øst, Denmark

[3]Aalborg University, Department of Civil Engineering, Division of Water and Environment – Thomas Manns Vej 23, 9220 Aalborg Øst, Denmark

Abstract

Plenty of research has been performed to quantify microplastics in bottled water. To achieve a standardized method for microplastics isolation, general practices for microplastics analysis have been proposed to ensure reliable results, such as optimized sample volume, guidelines to prevent sample contamination, and methods to count and identify the microplastics isolated. An adequate sample volume is a relevant parameter as the microplastics concentration per size range varies with it, being higher for small particles ($< 100\mu$m) and lower for large particles ($> 300\mu$m). Therefore, a representative volume of the sample is needed to estimate correctly the content of particles. In this work, an isolation methodology of fractionated filtration is implemented for bottled water processing to ease the processing of larger sample volumes and reduce sample contamination by limiting the contact of the sample with the environment during the filtration. The experimental process compares the performance of the traditional fractionated filtration in sequential filtrations to the method proposed. The process consists of 4 sequential filtrations with each method: 3 replicates and one blank. In each filtration, 10 liters of bottled water, from the same brand and batch, were filtered through 3 filters in sequence with pore sizes of 10μm, 5μm, and 1μm. Later the samples were processed chemically to remove any organic matter. The microplastics collected were mixed with filtered alcohol, deposited on ZnSe windows, and analyzed with a μFTIR spectrometer. Additionally, the proposed method performs a separation of microplastics by size which enables the identification with a different analytical method per size range (FTIR for larger particles$> 10\mu$m and Raman for smaller ones $< 10\mu$m) to enhance the quantification. The polymer types and the particles quantified were compared to determine the performance of the system. Further analysis is required on the collected data to enhance the repeatability

Keywords: representative sample, micro, FTIR, sample processing

*Speaker

†Corresponding author: natalia.andrea.gutierrez.andrade@vub.be