Supplementary Materials for:

UV exposure to PET microplastics increases their downward mobility in stormwater biofilters undergoing freeze-thaw cycles

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Total Tables: 4
Total pages: 7

Table S1: Microplastics recovery and methodology variations tests (as from previous study from our lab (Koutnik et al., 2022)).

Sample	Picture	Analyzed by	MP Count	MP Expected
Sample 1	1	Person 1	7	10
Sample 1	2	Person 1	10	10
Sample 2	1	Person 1	22	24
Sample 2	2	Person 1	25	24
Sample 3	1	Person 1	34	30
Sample 4	1	Person 1	180	200
Sample 4	2	Person 1	198	200
Sample 4	3	Person 1	193	200
Sample 5	1	Person 1	94	100
Sample 5	2	Person 1	107	100
Sample 5	3	Person 1	98	100
Sample 1	1	Person 2	6	10
Sample 1	2	Person 2	7	10
Sample 2	1	Person 2	21	24
Sample 2	2	Person 2	20	24
Sample 3	1	Person 2	33	30
Sample 4	1	Person 2	184	200
Sample 4	2	Person 2	188	200
Sample 4	3	Person 2	197	200
Sample 5	1	Person 2	99	100
Sample 5	2	Person 2	109	100
Sample 5	3	Person 2	90	100

Table S2: Results of microplastics recovery and methodology variations tests (as from previous study from our lab (Koutnik et al., 2022)).

Microplastics Recovery Rate	93.7% ± 13.7%
Human Processing Variation	7%
Sample Processing Variation	9.10%

Table S3: A Turkey one-way test indicates the specific p-values for each comparison pair testing the % increase in mobility at various weathering times (Figure 3-E).

Comparison Pair	p-value (adjusted for multiple comparisons)
1 cm Depth	
PET30-PET15	0.0085
PET60-PET15	0.0008
PET60-PET30	0.0842
2 cm Depth	
PET30-PET15	0.0087
PET60-PET15	0.00003
PET60-PET30	0.0004

Table S4: A Turkey one-way test indicates the specific p-values for each comparison pair testing microplastic concentration in effluent at various weathering times (Figure 4).

Comparison Pair	***p-value (adjusted for multiple comparisons)***
PET15-PET0	0.5610
PET30-PET0	0.0438
PET60-PET0	0.0394
PET30-PET15	0.2830
PET60-PET15	0.2571
PET60-PET30	0.1000

FTIR methodology

Microplastics were characterized for their size distribution, shape, and for polymer types using Thermo Scientific Nicolet™ iN10 Fourier Transform Infrared spectroscopy (FTIR) in the reflectance mode. First, the microscope was calibrated using an in-house reference standard of high-density polyethylene to ensure that the device was functioning in a reproducible way. Then, sample particles were placed onto a clean gold-coated slide and dispersed with ethanol. A particle map of ~1 cm^2 area was analyzed using the particle analysis wizard included in the PICTA™ software. A portion of the particle map with even particle spacing and a low amount of overlapping particles was selected for FTIR analysis to yield individual spectra for each particle. Default image analysis settings were used in the particle wizard to differentiate particles from the gold slide. Spectra were measured using a resolution of 0.124 cm^{-1} and 1 scan, over a spectral range of 4000 - 675cm^{-1}. The background was collected immediately after the samples at a reference point made of reflective gold. Spectra were automatically converted to absorbance intensities from reflectance in the software. To identify particle composition and frequency of various polymers, the collected spectra were compared across all available commercial libraries (Supporting Material). The OMNIC correlation routine was used to compare each particle to the reference database. The criteria for reporting a match in the spectra libraries was set to a 15% match score. Matches were confirmed if above 60%.

FTIR microscope can identify the size distribution of microplastics based on image analysis of particles within 1 cm^2 area with a limited number of particles dispersed in that area. Under the current setting to scan 1 cm^2 area on the slide, the iN10 could not reliably detect microplastics' size and shape below 20 μm diameter. Thus, we also used the laser diffraction method to analyze the size distribution of microplastics at a wider range (0.1 μm to 2 mm). Briefly, the particle size distributions of three microplastics polymer types were measured using a laser diffraction particle size analyzer (LS 13320, Beckman Coulter, Inc. CA, USA). As dispersion of microplastics in water can be difficult due to density difference, dry microplastics were injected into the analyzer where the Tornado Dry Powder System dispersed the dry microplastics in the chamber where the diffracted laser beams were analyzed to calculate the particle size distribution assuming a spherical equivalent of the microplastics. Thus, the size distribution obtained by this method does not provide information related to the shape of the microplastics.

FTIR libraries

Polymer Laminate Films, Cross Sections Wizard, Hummel Polymer Sample, Polystyrene Quality Control, NIR Polystyrene QC, Synthetic Fibers by Microscope, HR Hummel Polymer and Additives, HR Aldrich Hydrocarbons, HR Nicolet Sampler Library, HR Polymer Additives and Plasticizers, HR Specta Polymers and Plasticizers by ATR, HR Specta Polymers and Plasticizers by ATR - Corrected, HR Spectra IR Demo, In house library, OTC Pharmaceuticals Microscope.

References

Koutnik, V.S., Leonard, J., Glasman, J.B., Brar, J., Koydemir, H.C., Novoselov, A., Bertel, R., Tseng, D., Ozcan, A., Ravi, S., Mohanty, S.K., 2022. Microplastics retained in stormwater control measures: Where do they come from and where do they go? Water Res. 210, 118008. https://doi.org/10.1016/j.watres.2021.118008