

# Device for Low Cross-Contamination and High-Efficiency Sampling of Microplastics Less Than 20 $\mu\text{m}$ in Size from Water

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## Supplementary Materials

Table S1. CFD analysis conditions for the sampling devices

Software Info.	
Program	FLOW-3D (Flow Science, inc. 683 Harkle Rd, Suite a Santa Fe, Nm 87505 USA)
Solver version	12.0.3.02 Inx64 02/05/2021 HPC
Physics model	
Gravity	-9.81 m/s
Viscosity	Viscous flow
Turbulence	Renormalized group (RNG) model
Fluid properties	
Density	1000 kg/
Viscosity	0.001 kg/m/s (constant)
Reference pressure	101,300 Pa
Mesh	
Mesh type	Structured grid (with FAVOR™)
Reference cell size	0.1 mm
number of total cells	8,000,000

**Table S2.** Recovery results using Device 1 with reference material

No.	Initial weight of STS filter (mg)	D.I. water volume (mL)	Microplastics		Final weight of STS filter (mg)	Recovery (%)
			Type	Weight (mg)		
1	594.13	500	PP	30.0	622.75	<b>94.3 ± 1.7</b>
	596.12				623.93	
	592.05				620.30	
2	568.44	500	PS	30.0	592.95	<b>86.3 ± 5.0</b>
	576.41				602.79	
	573.83				600.91	
3	596.08	500	PET	30.0	622.15	<b>93.0 ± 5.6</b>
	548.51				577.37	
	583.12				612.00	
4	573.46	500	PVC	30.0	602.26	<b>95.9 ± 0.9</b>
	571.89				600.38	
	573.45				602.46	
5	548.75	500	PE	30.0	571.82	<b>90.0 ± 11.3</b>
	573.85				602.71	
	579.96				609.01	

**Table S3.** Recovery results using Device 2 with reference material

No.	Initial weight of STS filter (mg)	D.I. water volume (mL)	Microplastics		Final weight of STS filter (mg)	Recovery (%)
			Type	Weight (mg)		
1	551.37	500	PP	30.0	580.56	<b>89.9 ± 6.7</b>
	548.98				575.30	
	551.37				580.56	
2	548.67	500	PS	30.0	576.92	<b>93.0 ± 1.0</b>
	552.33				580.10	
	548.67				576.92	
3	539.11	500	PET	30.0	568.18	<b>96.2 ± 3.4</b>
	574.55				603.33	
	580.15				609.27	
4	574.26	500	PVC	30.0	599.86	<b>85.3 ± 1.1</b>
	574.38				600.23	
	573.66				598.80	

	596.38				624.90	
5	593.22	500	PE	30.0	621.04	<b>94.0 ± 1.1</b>
	574.18				602.25	

**Table S4.** Recovery results using Device 3 with reference material

No.	Initial weight of STS filter (mg)	D.I. water volume (mL)	Microplastics		Final weight of STS filter (mg)	Recovery (%)
			Type	Weight (mg)		
	576.16				603.38	
1	592.36	500	PP	30.0	620.58	<b>92.7 ± 2.0</b>
	593.75				621.82	
	577.42				599.13	
2	580.78	500	PS	30.0	606.40	<b>90.0 ± 4.8</b>
	570.27				598.74	
	560.04				594.17	
3	595.41	500	PET	30.0	623.18	<b>100.6 ± 11.2</b>
	572.12				600.91	
	595.87				626.13	
4	572.62	500	PVC	30.0	599.53	<b>93.9 ± 5.4</b>
	574.80				602.40	
	580.00				608.57	
5	581.91	500	PE	30.0	610.00	<b>93.6 ± 1.4</b>
	574.87				602.52	

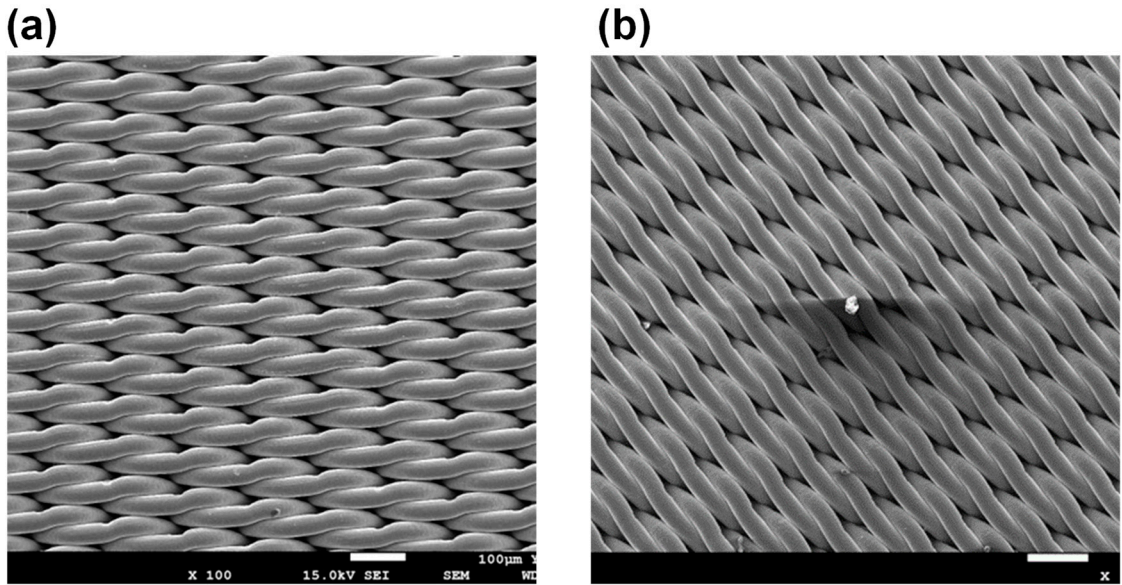
**Table S5.** Size distribution 10% value size (µm)

Microplastic type	Stage size range		
	Under 20 µm	20–45 µm	Over 45 µm
<b>PE</b>	10.8	13.1	15.6
<b>PET</b>	6.5	7.7	45.8
<b>PS</b>	8.3	10.3	16.1
<b>PP</b>	8.1	8.5	9.6
<b>PVC</b>	9.5	10.4	32.5

**Table S6.** Size distribution 90% value size (µm)

Microplastic type	Stage size range		
	Under 20 µm	20–45 µm	Over 45 µm
<b>PE</b>	37.7	66.5	111.3
<b>PET</b>	19.3	24.9	113.3
<b>PS</b>	22.1	40.5	209.3

PP	21.8	28.8	105.2
PVC	21.6	28.8	125.9



**Figure S1.** SEM image of STS filter (a) before and (b) after filtration.



**Figure S2.** Visual results after filtration using the STS filter in (a) Device 1, (b) Device 2, (c) Device 3.