

Electronic Supplementary Information (ESI)

An approach for extraction, characterization and quantitation of microplastics in natural marine snow using Raman microscopy

Shiye Y. Zhao,^{a,b} Meghan Danley,^c J. Evan Ward,^d Daoji Li^a and Tracy J. Mincer^{*b}

^a State Key Laboratory of Estuarine and Coastal Research, East China Normal University, 3663 North Zhongshan Road, Shanghai 200062, China

^b Marine Chemistry & Geochemistry, Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, Massachusetts 02543, United States.

^c Marine Biology, University of New England, 11 Hills Beach Rd, Biddeford, Maine 04005, United States.

^d Department of Marine Science, University of Connecticut, 1080 Shennecossett Road., Groton, Connecticut 06340, United States.

*Corresponding author: Tracy J. Mincer; E-mail: tmincer@whoi.edu. Marine Chemistry & Geochemistry, Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, Massachusetts 02543, United States. Fax: 508-457-2075.

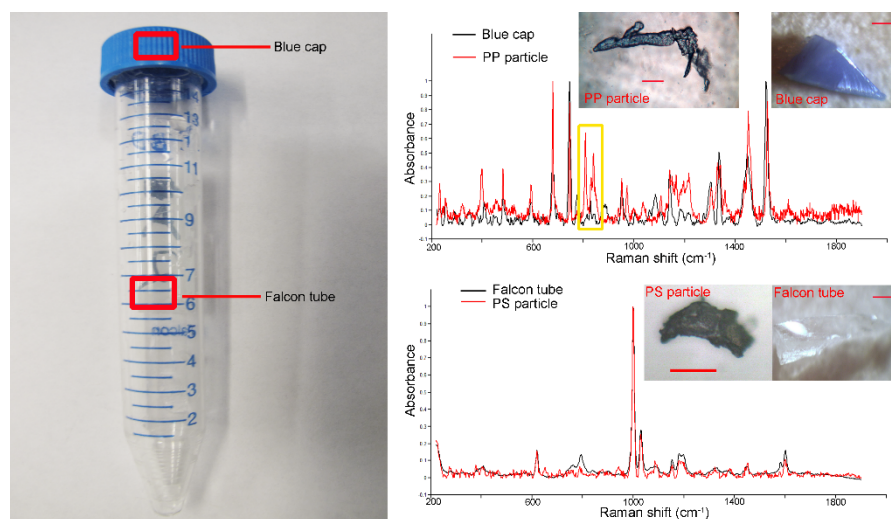


Fig. S1 Comparison between scrapings sampled from a Falcon tube and extracted particles from marine snow (PP: polypropylene; PS: polystyrene)

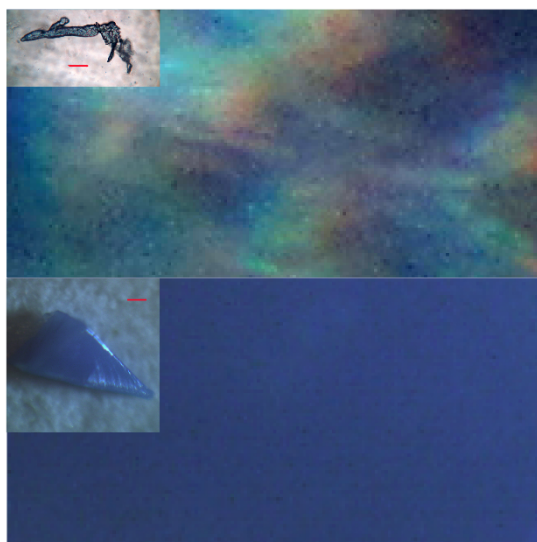


Fig.S2 Variant surface color appearances of the blue plastic particle extracted from marine snow and the scraping sampled from a Falcon tube cap using 8X digital zoom.

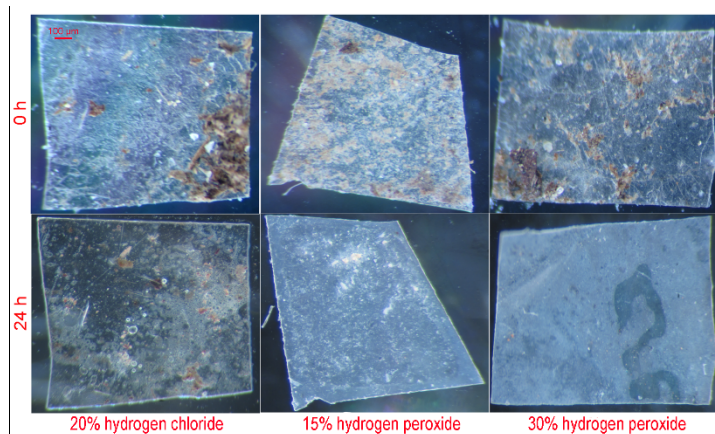


Fig. S3 Efficiency of hydrogen peroxide (15%, 30%) and hydrochloric acid (20%) to remove organic of biological origin within 24 h incubations. Note similarity among the 15% and 30% hydrogen peroxide treatments.

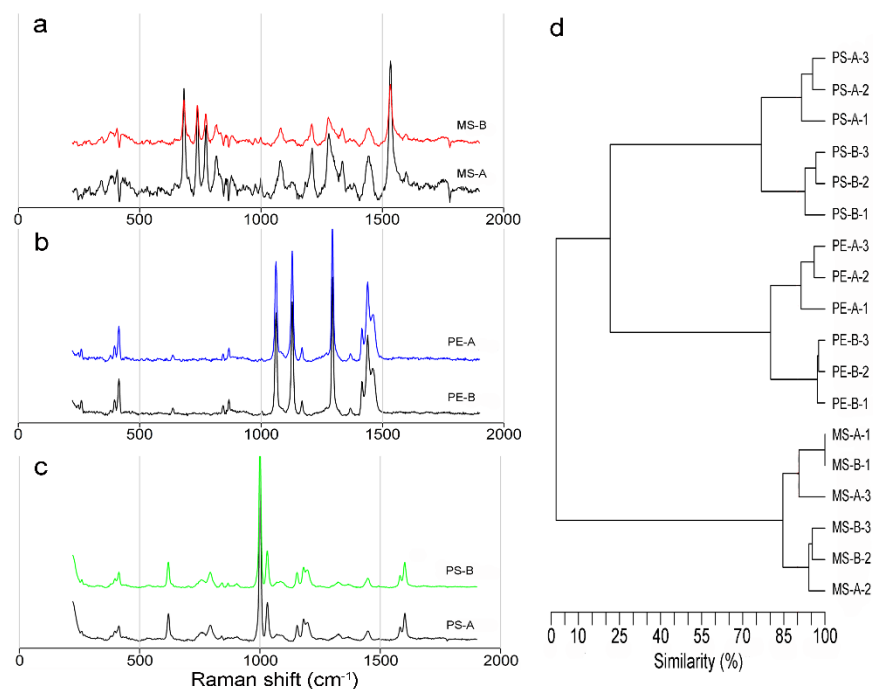


Fig. S4 Averaged Raman spectra of microspheres (a, MS: fluorescent green, polyethylene microspheres), polyethylene fragments (b, PE) and polypropylene fragments (c, PP) before (-B) and after (-A) 15% H₂O₂ treatment; Cluster analysis of the Raman spectra (MS, PE, PP) based on a Euclidean similarity matrix (d).

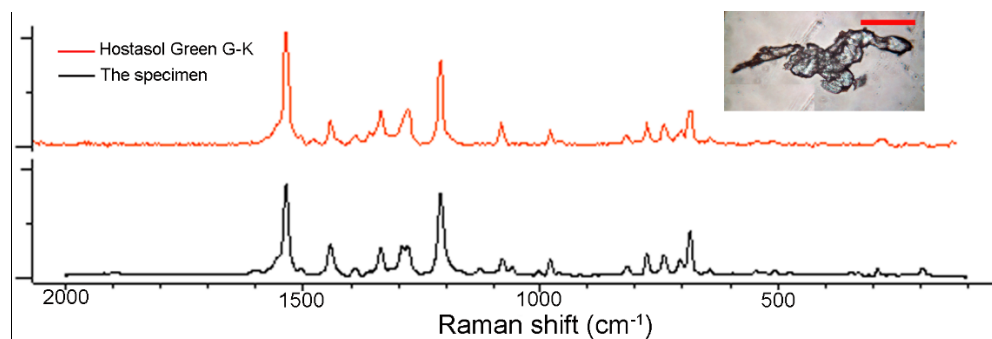


Fig. S5 Raman spectrum of the additive Hostasol Green (red trace) and a spectrum of a fragment extracted from marine snow (black trace), illustrating how this colorant could possibly mask the base polymer spectrum (scale bar: 100 μm).

Table S1: Particles were classified into two groups: **fragments** (e.g., **hard and flexible pieces**), **fibers**. Colors of MP were recorded and identified as one of three color tone types: light (white, yellow, yellow-brown); mid (green, red, blue, etc.); dark (grey, black, dark

Sample	Volume (ml)	total particle	Visual Identification					Confirmed by Raman					No spectra					No spectra					
			Shape		Color			Shape		Color			Shape		Color			Shape		Color			
			Fiber	fragment	light	mid	dark	Fiber	fragment	light	mid	dark	Fiber	fragment	light	mid	dark	Fiber	fragment	light	mid	dark	
A	13	8	3	5	1	6	1	2	3	1	4	0	1	2	0	2	1	A	1	2	0	2	1
A2	14	13	3	10	4	6	3	1	4	3	1	1	2	6	1	3	4	A2	2	6	1	3	4
B	14	15	5	10	3	9	3	1	9	3	7	0	4	1	0	2	3	B	4	1	0	2	3
B2	14	14	2	12	4	9	1	1	12	4	8	1	1	0	0	1	0	B2	1	0	0	1	0
C	13.5	9	2	7	2	6	1	0	6	0	6	0	2	1	1	0	2	C	2	1	1	0	2
C2	14	10	1	9	1	9	0	0	9	0	9	0	1	0	1	0	0	C2	1	0	1	0	0
D	13.75	8	1	7	0	8	0	0	6	0	6	0	1	1	0	1	1	D	1	1	0	1	1
D2	14	7	4	3	3	4	0	3	2	2	3	0	1	1	1	1	0	D2	1	1	1	1	0

Table S2: Classification of fragments according to size (in micrometers, μm) and shape. Text in red refers to fragments that did not have sufficient Raman spectral signature to positively identify.

A-size	A2-size	B-size	B2-size	C-size	C2-size	D-size	D2-size
406	224.6	249.1	351.5	500.3	1018.8	562.2	403.6
344.6	693.1	209.2	283.4	450.9	481.9	276.3	170.6
803.5	378.5	319.4	70	313.1	528.4	363.8	803.3
717	232.6	513.1	275.7	315.9	584.4	243.8	185.4
1482.1	508.8	342.9	172.5	113.5	1556.3	356.5	243.6
347.4	371.8	888.4	593.8	461.6	475.9	209.7	165
449.1	1192.9	370.9	578.4	271.6	491.9	64	181.6
115.1	1045.5	347.5	341.6	303.4	633.4	267.2	
	468.8	245.2	364.4	84.8	461.9		
	395.4	517.9	479.4		426.6		
	270.6	246.8	275				
	345.7	395.9	286.6				
	325.7	502.2	167.7				
		722.4	212				
		309.1					

