microplastics

MDPI

-Supplemental Information

Experimental Validation of the Microplastic Index – Two Approaches to Understanding Microplastics Formation

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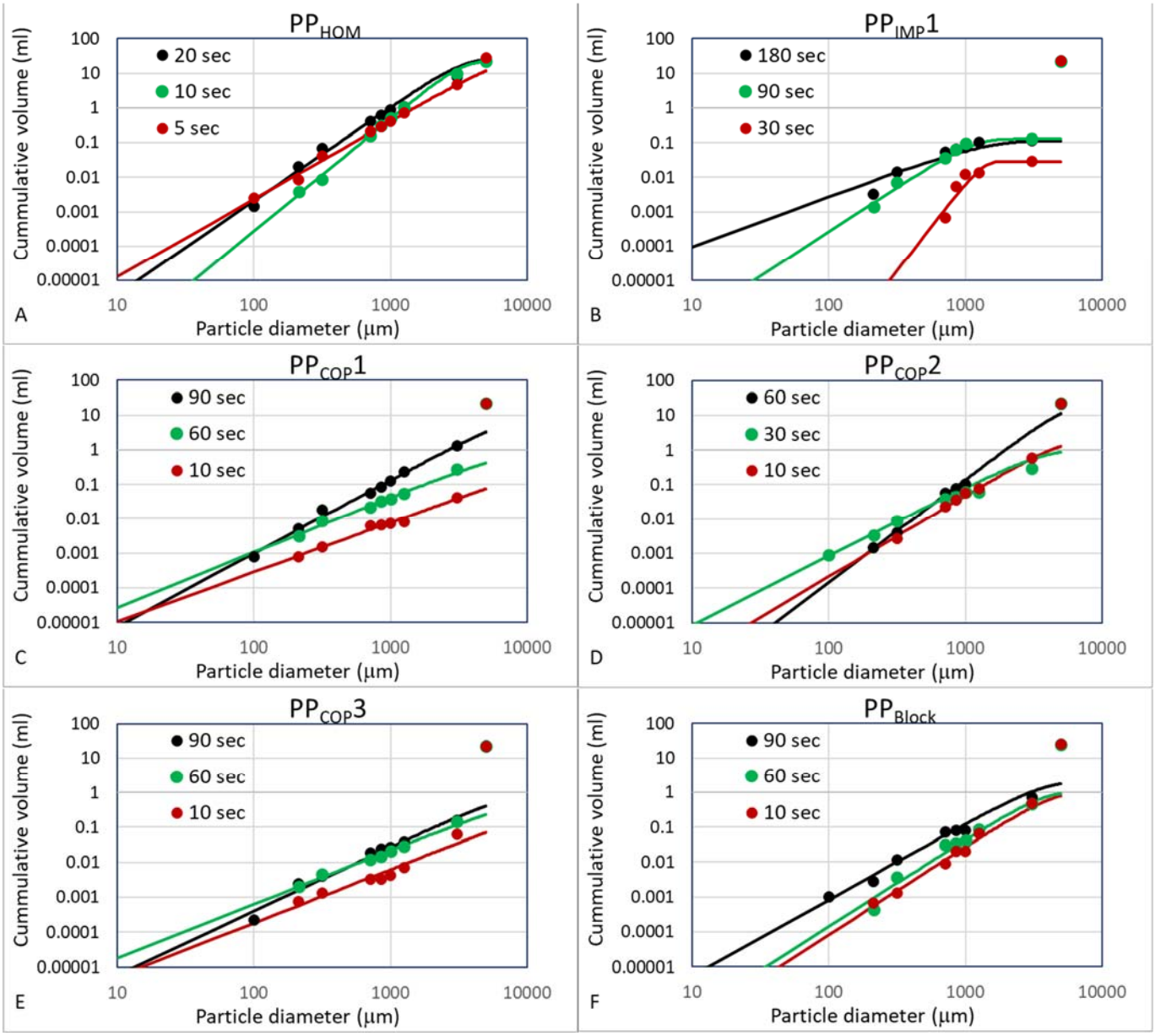
Supplemental Information S1: Experimental data for the particle distributions after the milling of the polymers



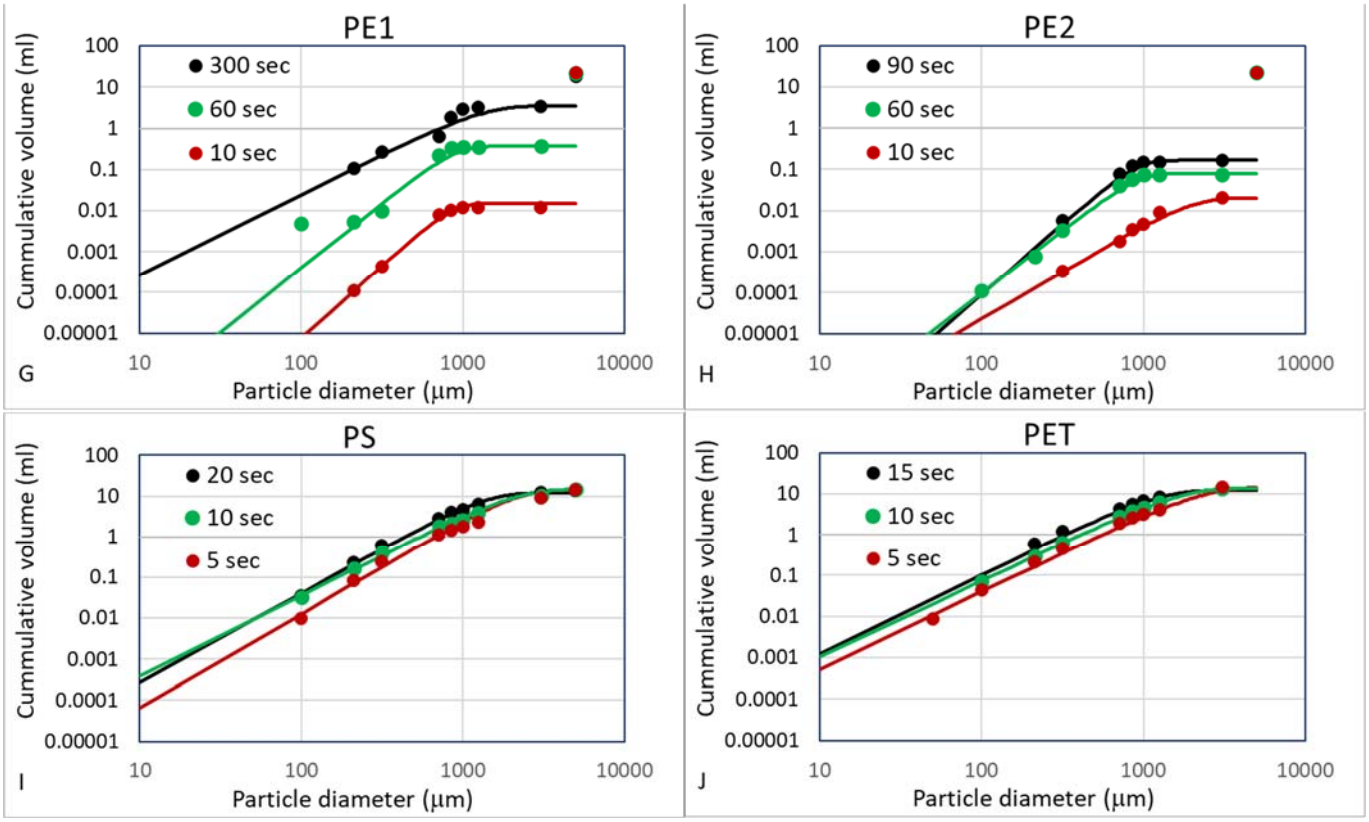


Table S1. Mill volume (V_{MILL}), Applied milling energy (J), Weibull parameters (β, λ), cumulative area created by grinding (F_A), modal particle diameter (D_M) and final volume of generated particles by impact (VI_{FA})

	Milling time (s)	V_{MILL} (ml)	E_V (J)	β (–)	λ (µm)	F_A (cm^2)	D_M (µm)	VI_{FA} (mm^3/J)
PP_{HOM}	5	28.0	282	2.25	6559	328.46	54.9	6.39
	10	21.7	456	3.26	3205	587.60	54.9	7.07
	20	25.6	812	2.71	3249	750.61	54.9	5.07
$PP_{IMP}1$	30	0.029	1994	5.13	1317	1.63	111	0.009
	90	0.127	6498	2.56	1108	11.29	111	0.019
	180	0.114	16507	1.46	1285	16.94	111	0.011
$PP_{COP}1$	10	0.079	645	1.43	29277	3.14	61.7	0.030
	60	0.549	2658	1.60	7278	17.66	61.7	0.041
	300	4.06	4567	2.12	7647	92.13	61.7	0.124
$PP_{COP}2$	10	2.10	839	2.35	4893	43.98	49	0.256
	30	2.07	1524	1.99	3473	49.78	48.9	0.160
	60	16.8	3878	2.98	5303	303.34	48.9	0.382
$PP_{COP}3$	10	0.074	1080	1.54	27121	2.56	198	0.047
	60	0.266	4466	1.54	11798	9.09	198	0.040
	90	0.526	6700	1.83	2000	13.87	198	0.041
PP_{BLOCK}	10	1.00	728	2.52	4182	23.79	176	0.575
	60	2.44	2558	2.50	3495	48.94	176	0.337
	90	4.25	3198	2.19	3542	93.98	176	0.517
PE1	10	0.015	752.00	3.54	848	1.48	62	0.012
	60	0.365	1630.00	3.15	873	36.78	61.7	0.139
	300	3.47	10255.69	1.96	1265	336.30	61.7	0.202
PE2	10	0.020	662	2.30	1904	1.13	157	0.027
	60	0.079	3116	3.06	890	7.90	156.7	0.040
	90	0.166	4586	3.42	892	15.77	156.7	0.054
PS	5	14.3	127	2.30	2128	714.78	3.0	1.67

	10	14.5	185	1.98	2083	847.52	3.0	1.37
	20	11.8	390	2.18	1340	974.86	3.0	0.747
PET	5	14.2	127	1.88	2256	807.19	49	31.2
	10	13.8	150	1.85	1675	1071.63	48.9	34.9
	15	12.1	158	1.93	1180	1278.91	48.9	39.5

Supplemental Information S2: Crystallinity of the polymers used

The crystallinity of the polymers was obtained using a TA Instruments DSC25. The heating and cooling rates were 10 K/min and the atmosphere was nitrogen.

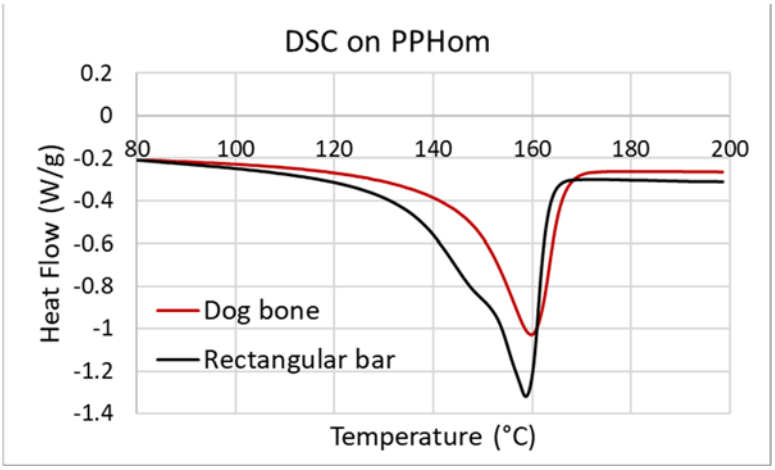


Figure S2. DSC traces of the first heating curves of the two samples assessed for PP_{Hom}: Small dog bone sample and larger rectangular bar.

The crystallinities of the polymers is calculated using the enthalpy of melting as given by Grigorescu [20]. The results of the DSC measurements and calculations are listed in table S2.

Table S2. Heats of melting of the polymers assessed and calculated crystallinity.

Polymer		Dogbone		Rectangular bar	
	Melting enthalpy [20] (J/g)	Heat of melting from DSC (J/g)	Crystallinity (%)	Heat of melting from DSC (J/g)	Crystallinity (%)
PP_{Hom}	207	95.1	46	118.7	57
$PP_{Imp}1$	207	67.5	33	72.6	35
$PP_{Cop}1$	207	78.9	38	80.7	39
$PP_{Cop}2$	207	97.5	47	102.7	50
$PP_{Cop}3$	207	81.0	39	93.3	45
PP_{Block}	207	78.5	38	81.9	40
PE1	293	196.7	67	301.2	69
PE2	293	197.0	67	199.4	68