

Electronic supplementary material for:

Unexpected obstacles in mechanical recycling of polypropylene labels: Are ambitious recycling targets achievable?

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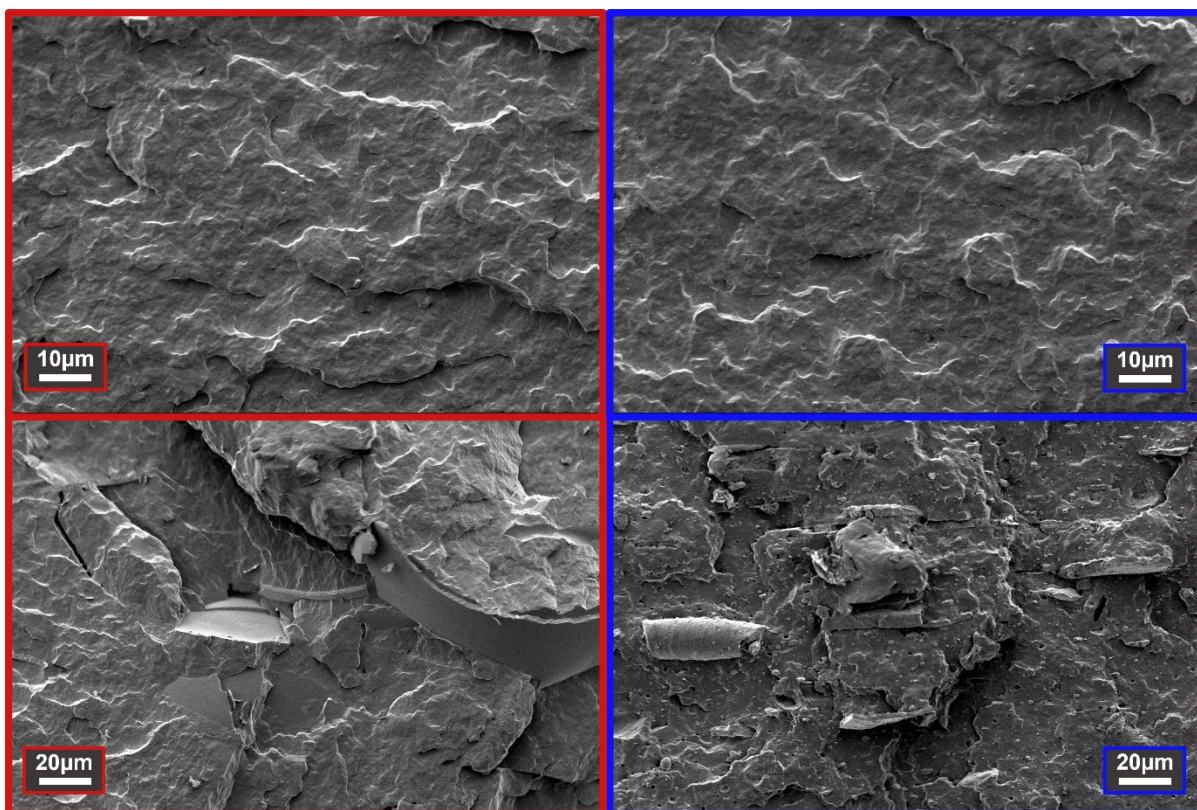


Figure S1. High (upper row) and low (lower row) magnification SEM micrographs of pre- (left column) and post-consumer (right column) processed labels.

Table S1. Cramer class I substances identified in unprocessed and processed pre-consumer labels and processed post-consumer labels.

Substance	CAS No.	Pre-consumer		Post-consumer
		Unprocessed	Processed	(processed)
(1-hydroxycyclohexyl)-phenylmethanone	947-19-3	x	x	-
1-phenylcyclohexan-1-ol	1589-60-2	-	x	-
1,3-ditert-butylbenzene	1014-60-4	-	-	x
2-ethylhexyl 2-hydroxybenzoate	118-60-5	-	-	x
2-ethylhexyl 4-(dimethylamino)benzoate	21245-02-3	x	-	x
2-ethylhexyl prop-2-enoate	103-11-7	-	-	x
(2E)-2-benzylideneoctanal	101-86-0	-	-	x
[2,2,4-trimethyl-3-(2-methylpropanoyloxy)pentyl] 2-methylpropanoate	6846-50-0	-	-	x
2,4-Ditert-butylphenol	96-76-4	x	x	x
2,4,5-trimethylbenzaldehyde	5779-72-6	x	x	x
2,6-ditert-butyl-4-methylphenol	128-37-0	x	x	x
6-prop-2-enoyloxyhexyl prop-2-enoate	13048-33-4	x	x	-
Bis(2-methylpropyl) benzene-1,2-dicarboxylate	84-69-5	-	x	x
Bis(6-methylheptyl) hexanedioate	1330-86-5	-	-	x
Cyclohexyl(phenyl)methanone	712-50-5	-	x	-
Cyclopentadecane	295-48-7	-	-	x
Cyclotetradecane	295-17-0	-	-	x
Decanal	112-31-2	-	-	x
Dibutyl decanedioate	109-43-3	-	-	x
Dodec-1-ene	112-41-4	-	-	x
Dodecane	112-40-3	-	-	x
Ethyl-2,4,6-trimethylbenzoate	1754-55-8	x	x	x
Ethyl dodecanoate	106-33-2	x	x	x
Ethyl hexadecanoate	628-97-7	-	x	-
Ethyl octadecanoate	111-61-5	x	x	x
Ethyl prop-2-enoate	140-88-5	x	-	-
Ethyl tetradecanoate	124-06-1	x	x	-
Henicosane	629-94-7	x	x	-
Heptacosane	593-49-7	-	x	x
Hexadecane	544-76-3	-	-	x
Hexadecanoic acid	57-10-3	x	x	-
Hexyl 2-hydroxybenzoate	6259-76-3	-	-	x
Icosane	112-95-8	-	x	x
Methyl hexadecanoate	112-39-0	-	-	x
Nonadec-1-ene	18435-45-5	-	-	x
Nonadecane	629-92-5	-	-	x
Nonanal	124-19-6	-	-	x
Octacosane	630-02-4	-	x	x
Octadec-1-ene	112-88-9	-	-	x
Octadecane	593-45-3	-	-	x
Pentacosane	629-99-2	-	x	x
Prop-1-en-2-ylbenzene	98-83-9	-	x	x
Propan-2-yl hexadecanoate	142-91-6	-	-	x
Styrene	100-42-5	-	x	-
Tetracosane	646-31-1	-	x	x
Tetradecanal	124-25-4	x	x	x
Tetradecane	629-59-4	-	-	x
Tetradec-1-ene	1120-36-1	-	-	x
Tributyl 2-acetyloxypropane-1,2,3-tricarboxylate	77-90-7	-	-	x
Tributyl (Z)-prop-1-ene-1,2,3-tricarboxylate	7568-58-3	-	-	x
(Z)-tetradec-3-ene	41446-67-7	-	x	-
(Z)-octadec-9-enal	2423-10-1	-	x	-

Table S2 Percentage mass of a label in a bottle packaging system (bottle, cap, label)

Type	Bottle volume	Label polymer	Total mass (packaging)	Label mass	Percentage of system
	L		g	g	%
Clever Mineralwasser, prickelnd	1.50	PP	30.70	0.80	2.61
Quellbrunn Vitaqua Quelle	1.50	PP	26.56	0.64	2.41
Tiroler Quelle	1.50	PP	30.77	0.66	2.14
Rauch Juice Bar	1.00	PP	50.23	0.97	1.93
Gasteiner, prickelnd	0.50	PP	20.39	0.42	2.06
Coca Cola Lemon	1.00	PP	32.05	0.38	1.19
Coca Cola, Zero	0.50	PP	22.35	0.24	1.07
Pepsi Cola	0.50	PP	22.05	0.40	1.81
Schartner Bombe, fruit Bowl	0.50	PP	23.70	0.23	0.97
Quellbrunn Vitaqua Quelle	0.50	PP	11.68	0.22	1.88
Crystal Geysler	0.50	PP	9.37	0.20	2.13
Waldquelle	1.50	PP	31.74	0.87	2.74
Frucade	0.50	PP	24.43	0.41	1.69
Vöslauer pr./Mild	1.50	PP	33.21	0.54	1.63
Vöslauer pr./mild 1/2 Palette	1.50	PP	33.21	0.54	1.63
Vöslauer prickelnd/ohne	0.33	PP	16.29	0.25	1.52
Vöslauer ohne	1.50	PP	31.61	0.54	1.71
Vöslauer ohne 1/2 Palette	1.50	PP	31.61	0.54	1.71
Vöslauer ohne/Balance/Biolimo	0.20	PP	16.21	0.17	1.02
Vöslauer Junior	0.33	PP	17.20	0.25	1.44
Vöslauer Balance	0.75	PP	21.96	0.62	2.82
Vöslauer Juicy-Balance	0.50	PP	21.60	0.35	1.62
Vöslauer mild 1l	1.00	PP	28.53	0.53	1.86
Vöslauer mild 0,5l	0.50	PP	18.30	0.35	1.91
Vöslauer Sport	0.75	PP	22.57	0.32	1.42
Vöslauer Baby	0.75	PP	21.62	0.32	1.48
Vöslauer Superprickelnd	1.50	PP	41.31	0.54	1.31
Vöslauer Superprickelnd	1.50	PP	41.31	0.54	1.31
Vöslauer Superprickelnd	2.00	PP	48.26	0.69	1.43
Vöslauer Ohne	2.00	PP	41.46	0.69	1.66
Vöslauer Ohne Junior	0.33	PP	17.20	0.25	1.44
Vöslauer 1l	1.00	PP	24.43	0.53	2.17
Mandarijnsap NL	1.00	PP	34.89	0.86	2.46
Quellbrunn Vitaqua Quelle classic	1.50	PP	26.49	0.50	1.89
Radenska naturelle	0.50	PP	16.29	0.35	2.15
Dana s sokom	0.50	PP	17.72	0.32	1.81
Edeka Frucht Liebe	1.00	PP	31.49	0.90	2.86
Mean value	-	-	26.78	0.48	1.81