Table 1. Estimated Half-Lives of Common Plastic Items[a]

Plastics type	Common applications	Typical thickness (μm)	Estimated Specific Surface Degradation Rate (min–max; μm year^{-1})[b]				Estimated half-lives (min–max; year)			
			Land (buried)	Land (accel. by UV/heat)[c]	Marine	Marine (accel. by UV/heat)[c]	Land (buried)	Land (accel. by UV/heat)[c]	Marine	Marine (accel. by UV/heat)[c]
1. PET	Single-use water bottle	500	0	–	–	110	>2500[d]	–	–	2.3
2. HDPE	Plastic bottles	500	1.0 (0.91–1.1)	1.3 (0.55–2.6)	4.3 (0–11)	9.5 (4.5–22)	250 (230–280)	190 (95–460)	58 (23 to >2500)	26 (12–55)
2. HDPE	Pipes	10,000	1.0 (0.91–1.1)	1.3 (0.55–2.6)	4.3 (0–11)	9.5 (4.5–22)	5000 (4600–5500)	3900 (1900–9000)	1200 (450 to >2500)	530 (230–1100)
3. PVC	Pipes	10,000	0	–	–	–	>2500[d]	–	–	–
4. LDPE	Plastic bags	100	11	22 (1.6–83)	15 (0–37)	10 (9.0–12)	4.6	2.3 (0.6–32)	3.4 (1.4 to >2500)	5 (4.2–5.5)
5. PP	Food storage container	800	–	0.51	7.5	4.6	–	780	53	87
6. PS	Insulating packaging	20,000	0	–	–	–	>2500[d]	–	–	–
7. Others	Biodegradable plastic bag	100	270 (20–1400)	320	16 (7.5–29)	180	0.19 (0.035–2.5)	0.16	3.1 (1.7–6.7)	0.29

[a]Half-life refers to conversion of the first 50% of the polymer mass, assuming pseudo-zeroth-order kinetics (i.e., invariant SA). According to eq 10, assuming cylindrical geometry and decreasing radius (but not height) over time predicts half-lives that are twice as long. Entries shown as (–) correspond to conditions for which no published data were found. Values in parentheses correspond to the range based on published reports. All values were rounded to two significant figures. [b]Values of 0 μm year^{-1} correspond to reports in which no degradation was observed; however it is likely that the duration of the experiment was too short to measure an appreciable weight loss. These values were included in calculations of average degradation rates and in the corresponding time ranges for complete degradation. [c]Corresponds to data collected in the presence of a degradation accelerant (e.g., UV pretreatment, thermal pretreatment, or microbial incubation) and/or for plastics containing a rapidly degrading filler (e.g., starch, PLA, etc.). [d]>2500 indicates that the relevant studies detected no measurable degradation, possibly due to the duration of the experiment being too short, allowing only an estimated lower limit for the extrapolated degradation time. The value 2500 years was obtained by calculating a SSDR based on the sensitivity of the balance used in the study and extrapolating a half-life for the thinnest material (100 μm, ca. 2500 years).

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