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Supplementary Information

Deposition and retention of differently shaped micro-particles on textiles during laundry processing.

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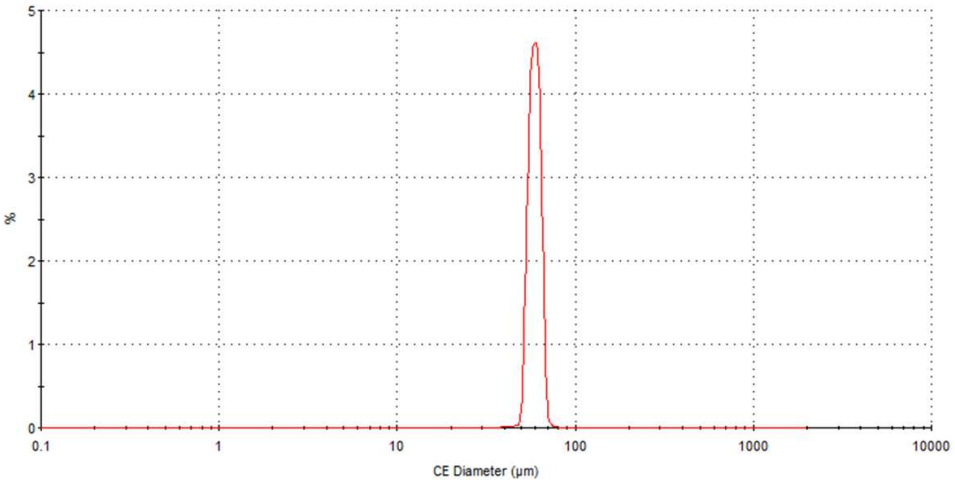
S1. Characterisation of particle size and aspect ratio

A Malvern Panalytical Morphologi G3 was used to analyse the particle size and aspect ratio distributions of both powders (Polyethylene and Polypropylene particles). 5 mm^3 of each powder was placed into the dispersion capsule and the high-pressure (5 bar) with pressure pulse injection time of 20 ms was used to disperse the powders evenly over a glass plate. Optical micrographs using a magnification of 5x (6.5 – 420 µm) was then used to image and analyse the particles. The projected scan area covered was around 10-100K particles.

Polyethylene (PE) microspheres

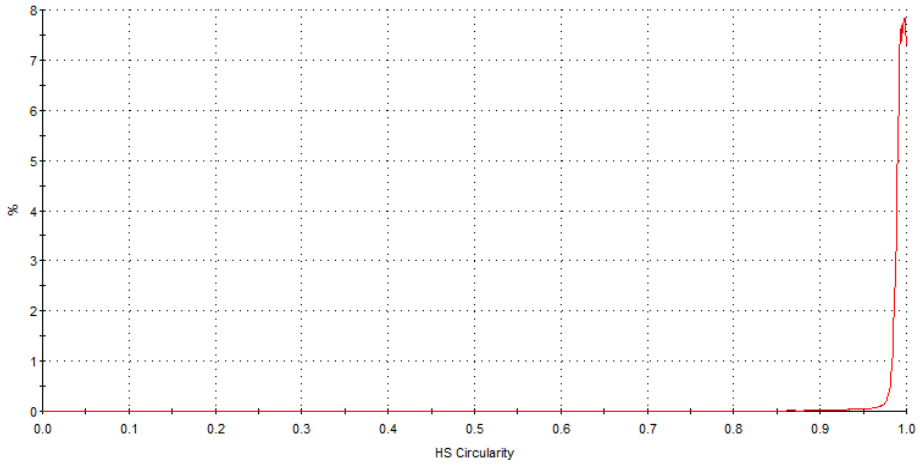
- *Particle size distribution*



Particles Counted: 10423

CE Diameter Minimum (µm): 15.24	**CE Diameter Maximum (µm):** 80.45	**CE Diameter STDV (µm):** 5.06
CE Diameter D[v, 0.1]: 53.78	**CE Diameter D[v, 0.5]:** 58.77	**CE Diameter D[v, 0.9]:** 64.14
CE Diameter D[4,3] (µm): 59.42	**CE Diameter D[3,2](µm):** 59.11	**CE Diameter RSD (%):** 8.67

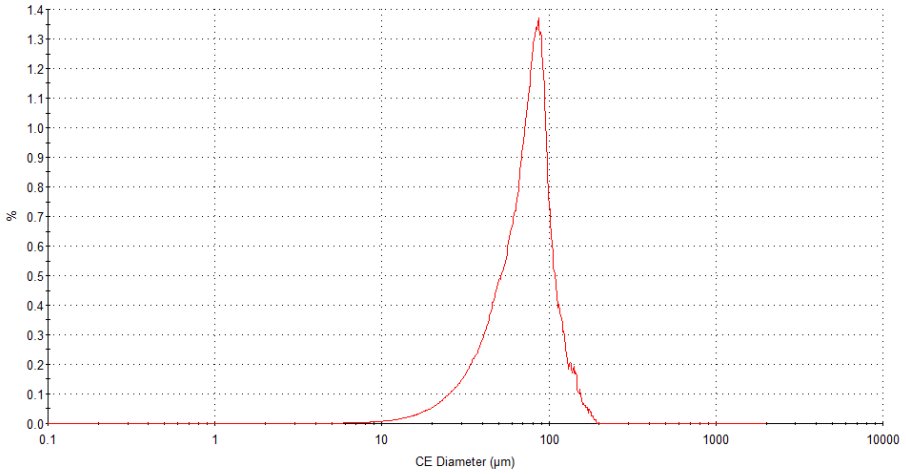
- *Aspect ratio distribution*



HS Circularity Minimum: 0.411	**HS Circularity Maximum:** 1.000	**HS Circularity Mean:** 0.990
HS Circularity D[n, 0.1]: 0.986	**HS Circularity D[n, 0.5]:** 0.993	**HS Circularity D[n, 0.9]:** 0.997
Particles Counted: 10423	**HS Circularity STDV:** 0.024	**HS Circularity RSD (%):** 2.420

Polypropylene (PP) particles

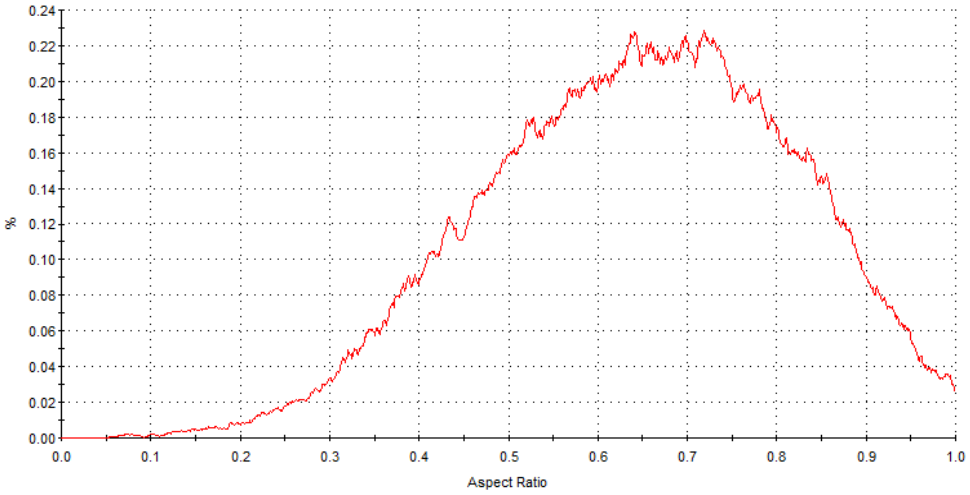
- *Particle size distribution*



Particles Counted: 47834

CE Diameter Minimum (µm): 2.16	**CE Diameter Maximum (µm):** 182.29	**CE Diameter STDV (µm):** 19.72
CE Diameter D[v, 0.1]: 36.96	**CE Diameter D[v, 0.5]:** 74.61	**CE Diameter D[v, 0.9]:** 108.1
CE Diameter D[4,3] (µm): 74.74	**CE Diameter D[3,2](µm):** 60.15	**CE Diameter RSD (%):** 109.76

Aspect ratio distribution



Aspect Ratio Minimum: 0.055

Aspect Ratio Maximum: 1.000

Aspect Ratio Mean: 0.644

Aspect Ratio D[n, 0.1]: 0.415

Aspect Ratio D[n, 0.5]: 0.652

Aspect Ratio D[n, 0.9]: 0.861

Particles Counted: 47834

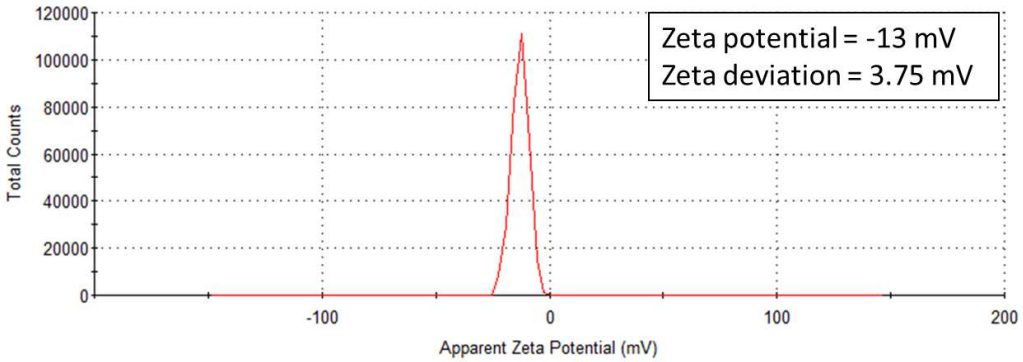
Aspect Ratio STDV: 0.169

Aspect Ratio RSD (%): 26.20

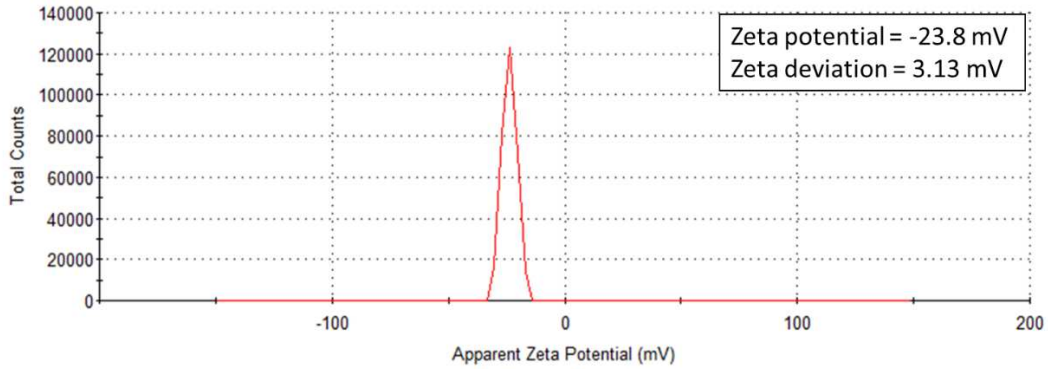
S2. Zeta-potential measurements

Measurements were performed using a Zetasizer Nano ZS (Malvern, U.K.) equipped with a helium-neon laser with a wavelength of 633 nm.

- Polyethylene (PE) microspheres



- Polpropylene (PP) particles



S3. Contact angle measurements

Contact angle measurements were performed using the sessile drop method using a KSV CAM 200 tensiometer. A drop of either pure water or a Tween 20 solution was deposited onto a pressed powder pellet and image were taken for analysis. Three to 5 contact angle measurements were made.

Table S3. Average contact angle made by a droplet of the aqueous solutions on the surface of a pellet of each powder.

	Contact angle, θ	
	Polyethylene	*Polypropylene*
Water	95±2	102 ±3
Water + 0.5wt% Tween 20	21 ±3	25 ±3

S4. Surface Roughness measurements

Tapping mode AFM (Bruker) over a range of scan sizes at scan rates between 0.15 Hz (20 µm scans) and 0.4 Hz (< 2 µm scans), using a 40 Nm^{-1} RTESPA-300 silicon cantilever from Bruker. Images were first flattened to remove curvature from the particles and/or the AFM scanner, then the standard roughness software in Nanoscope Analysis (Bruker) was applied to the entire image. For each powder ~20 particles were measured and averaged to gauge the average surface roughness.

Table S4. Average surface roughness values of the 2 particle systems

	Spherical Polyethylene	Irregular Polypropylene
Rq (nm)	245 (±95)	60 (±33)
Ra (nm)	159 (±70)	47 (±27)
Rz (nm)	2923 (±787)	452 (274)

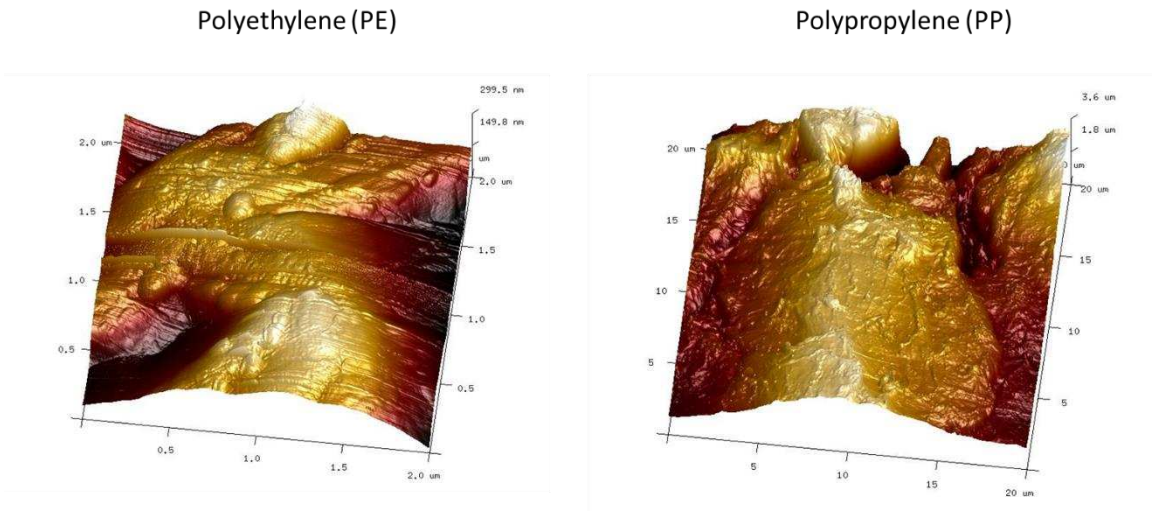


Figure S4. Example of Atomic Force Micrographs for the 2 different particle systems.