Supporting information

Risk for the release of an enormous amount of nanoplastics and microplastics from partially biodegradable polymer blends

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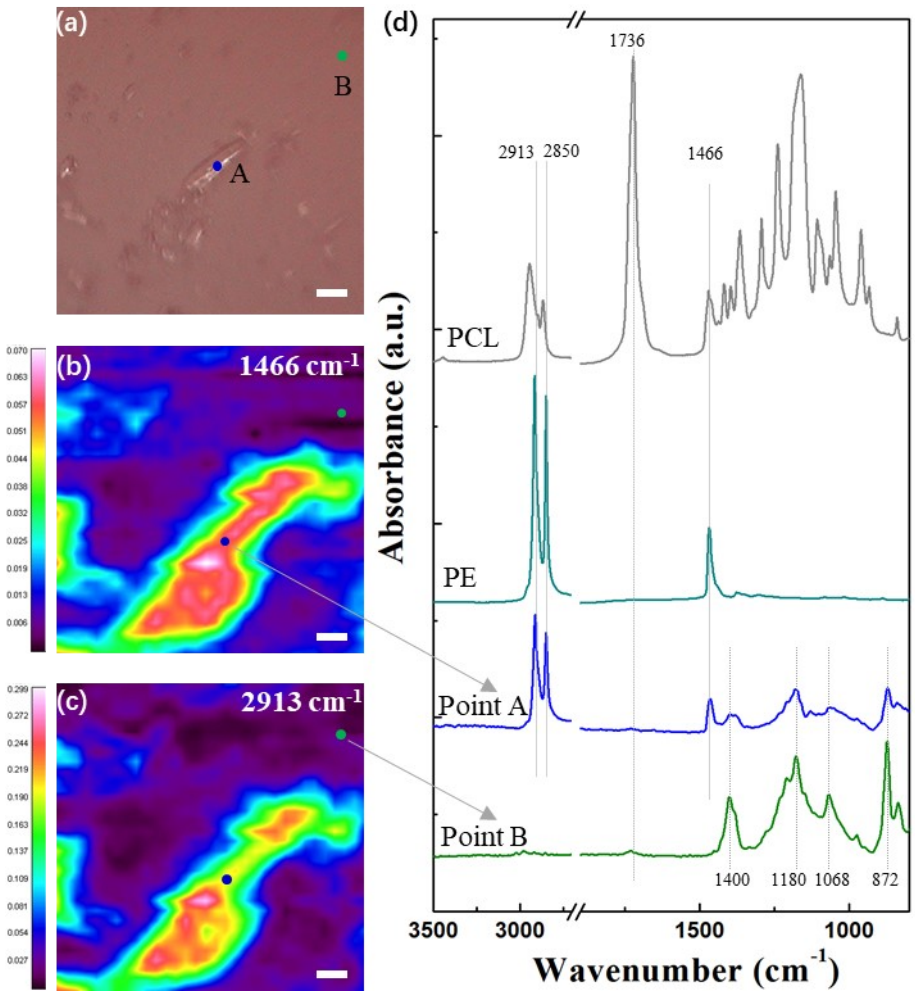

Fig. S1. IR microscope testing of the observed plastic particles on the polyvinylidene fluoride (PVDF) membrane. (a) image of the particles on the membrane; corresponding color image map of the absorption at 1466 cm^{-1} (b) and 2913 cm^{-1} (c), and (d) selected IR spectra from a microplastic location (point A) and from the membrane compared with the spectra of PE and PCL. The scale bars are 20 µm long. The investigated sample consists of particles collected on the membrane after filtering 3 ml of the NMP suspension after 2 days of ageing. Using double-sided adhesive tape, the membrane sample was fixed on a metal microscopy slide, which was placed on the stage of the IR microscope. Image data were acquired with an attenuated total reflection (ATR) objective, a pixel size of 6.25 µm at a resolution of 8 cm^{-1}, eight consecutive scans, and a wavenumber range of 4000 to 800 cm^{-1}. The area of the sample was imaged over 200 × 200 μm^2. The image maps and the IR spectra show that the observed particle in (a) shows the main IR bands of PE at 2913, 2850, and 1466 cm^{-1}, but the dominating band of PCL at 1736 cm^{-1} was not observed in the IR spectra of the particles. The presence of other additional peaks in the IR spectrum of point A is due to the membrane background. The results indicate that the observed plastic particles are made of PE rather than PCL.

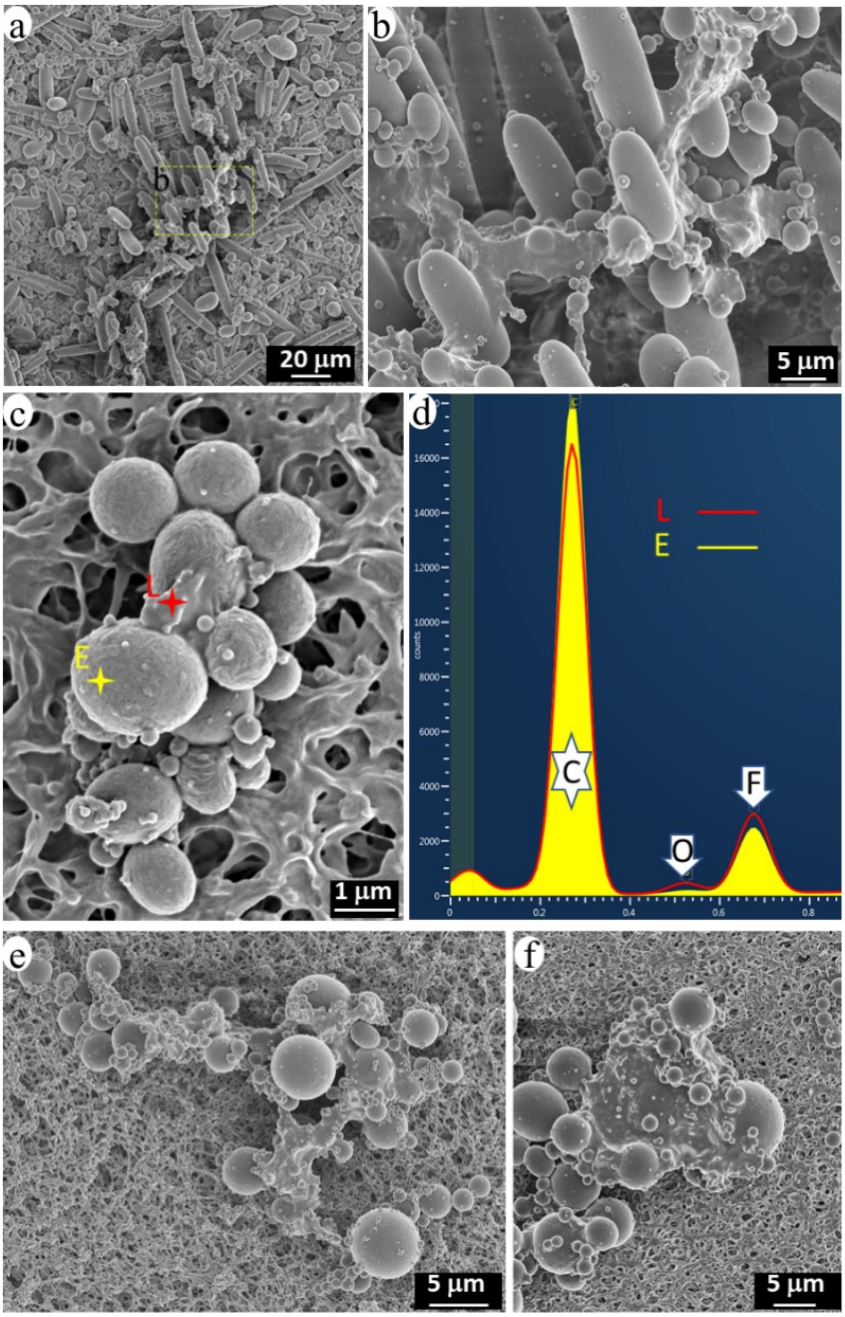

Fig. S2. SEM images in a and b show the blend fragments on the PVDF membrane for the PCL/PE sample after 2 days of ageing and after filtering 30 ml of the formed NMP suspension through one membrane. SEM images in c, e and f show the fragments on the membrane after filtering of 3 ml of the formed NMP suspension on one membrane for the samples after 2, 4, and 6 days of ageing, respectively. d shows the EDS results of the points on the PCL matrix (L) and PE particles (E). The EDS spectra show that the oxygen peak at point L is much greater than that at point E, confirming that the particles are PE while the connecting part is the PCL matrix as PCL consists of C, H and O, but PE only of C, H. The F peak in the EDS spectra is from the PVDF membrane background.

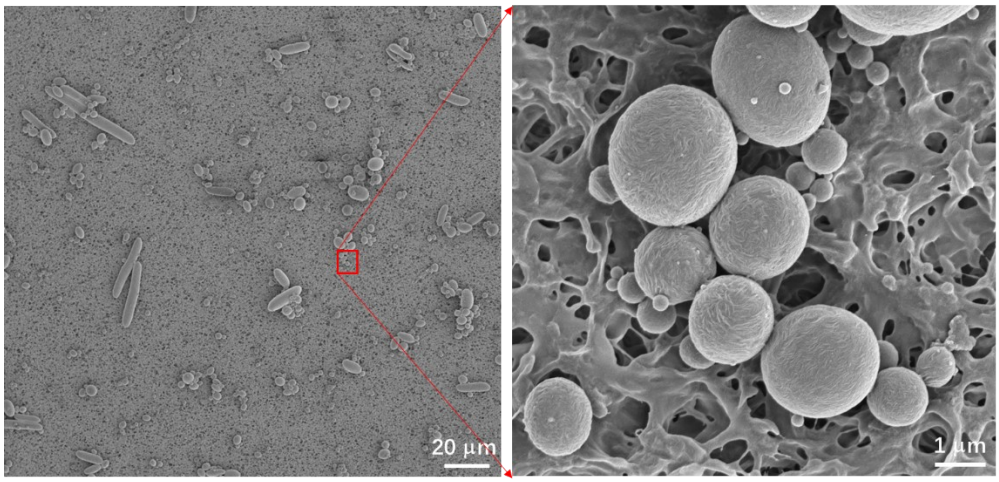

Fig. S3. SEM of the released particles on the PVDF membrane after filtering 3 ml of the formed NMP suspension through one membrane for the samples after 2 days of ageing. The enlarged graph shows that the particles aggregated together on the membrane, but without PCL matrix connection between them.

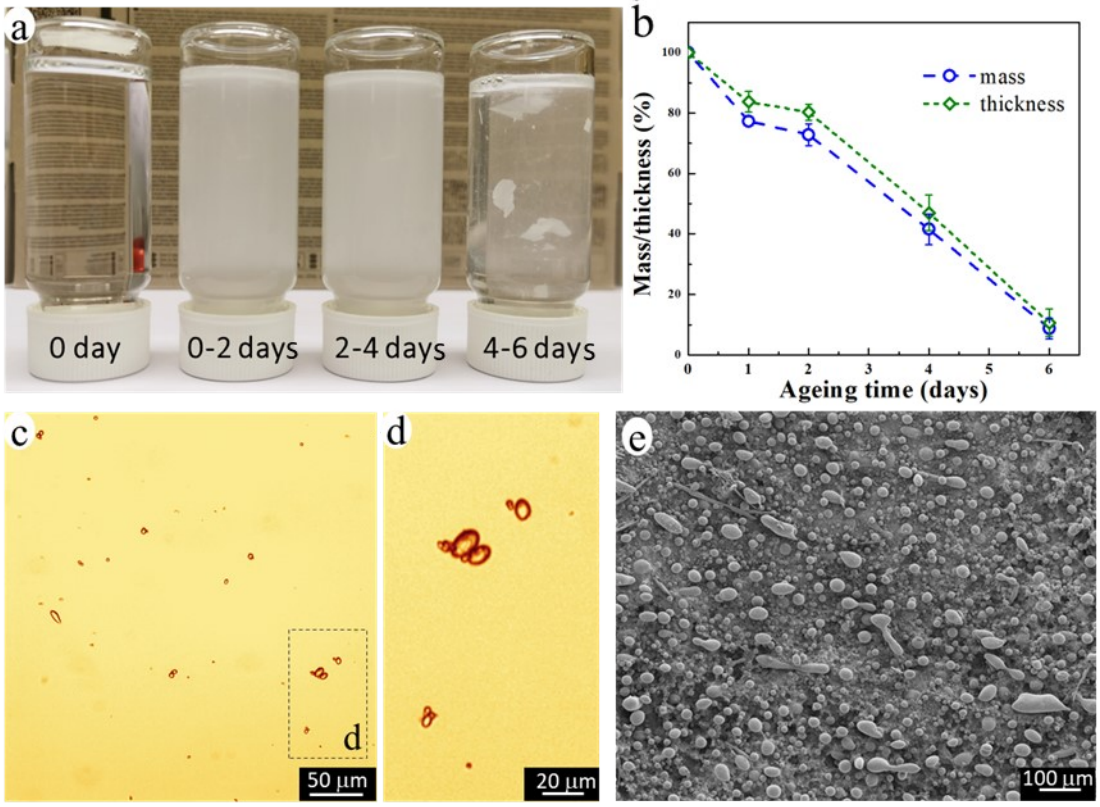

Fig. S4. NMPs formed during enzymatic hydrolysis of a PCL/PP blend with a mass ratio of 80/20: (a) image of the buffer solutions after different ageing periods (after shaking by hand); (b) the changes in mass and thickness of the film; (c-d) optical images of the formed particles for the sample with 4-6 days of ageing; and (e) SEM image of the surface of the blend film after 6 days of ageing.