

# Development of new microplastic reference particles of different polymer types, shapes and sizes in pre-defined numbers [428264]



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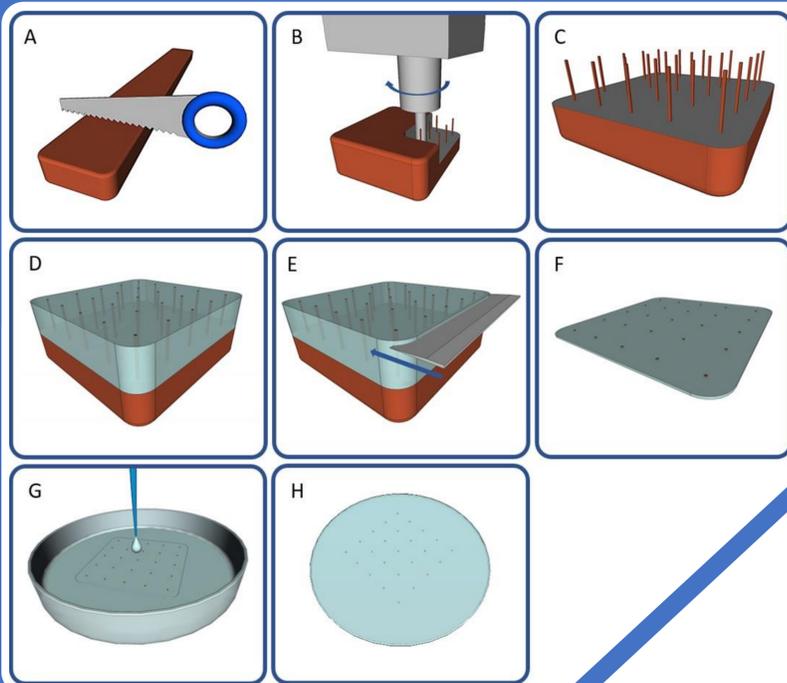
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## BACKGROUND

- There are many different methods for sampling, extraction, purification and analysis in microplastic (MP) research hampering comparability.
- A harmonization using reference particles with defined polymer types, sizes, shapes and numbers is needed
- However, there are no such reference particles (RP).
- Our goal was to develop a workflow for producing such RP which I. have variable defined properties, II. are fixed in a soluble matrix and thus III. can be introduced into a sample easily.

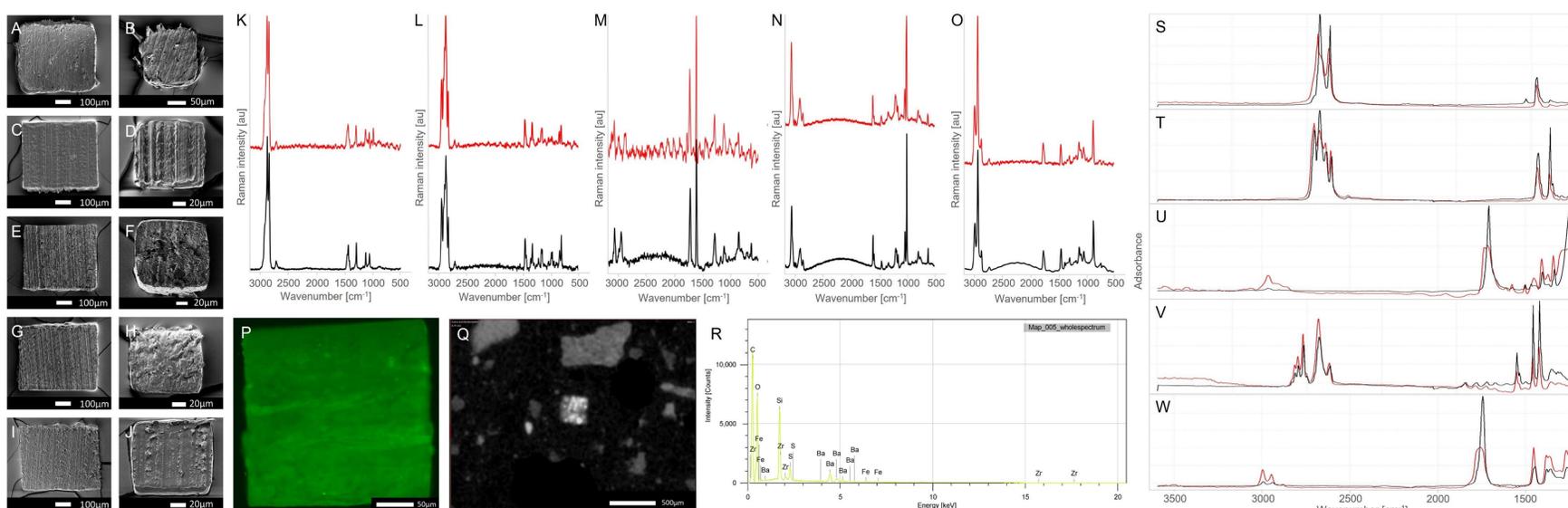
## METHODOLOGY



- A-C: Blocks with the desired chemical composition are shaped into a column plate form by cutting and CNC milling.
- D-E: The column plates get embedded in gelatin and cut using a cryo microtome.
- F-G: The resulting RPs are fixed in their gelatin sections by further embedding resulting in 25 RP containing gelatin pads (H).
- RPs were removed from the sections and analyzed using SEM, FTIR, Raman, EDX, fluorescence microscopy and CT.

## RESULTS

We produced coin and square shaped reference particles in a size range of 80 - 1000  $\mu\text{m}$  made of LD-PE, PP, PS, PET and PLA. Reference particles of these polymer types showed good FTIR and Raman spectra. They were detectable using fluorescence and CT imaging by means of respective staining. The overall size deviation from the intended sizes of the particles was  $8.45 \pm 11.41 \%$ .



SEM images of (A+B) PE-, (C+D) PP-, (E+F) PET-, (G+H) PS-, (I+J) PLA-RP with sizes of 500  $\mu\text{m}$  (A, C, E, G, I) and 125  $\mu\text{m}$  (B, D, F, H, J). FTIR spectra of our RP are given for (K) PE, (L) PP, (M) PET, (N) PS and (O) PLA in red as well as reference spectra in black. Raman spectra of our RP are given for (S) PE, (T) PP, (U) PET, (V) PS and (W) PLA in red as well as reference spectra in black. (P) A fluorescence image of an RP spiked with fluorescein. (Q) CT image of an RP spiked with BaSO<sub>4</sub> in a soil matrix. (R) EDX analysis of an SMP spiked with BaSO<sub>4</sub> and fluorescein.

Reference particles with defined shape, size, polymer type and number are now available