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Density separation of soils as sample preparation for the determination of plastics

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Plastics are found ubiquitously in all environmental media. Evidence of microplastic occurrence was also provided for various biota. At the beginning of the scientific debate, the oceans as final plastics sinks were in the foreground, whereas current research work focuses on the sources of input, including
surface waters. The water content of these surface waters are influenced by urban and rural areas, including the adjoining soils.
Like oceans, soils are a final sink for many substances, including plastics. Sources of plastics are diverse and depend on use and management. With respect to analytics, soil material is much more complex than suspended solids in water. Therefore the type of soil, grain size, the organic content as well as containing metal ions are important parameters.
For the detection of plastics, there are different analytical methods. Spectroscopic methods determine the particle numbers, sizes, and shapes. Pyrolytic methods return the total contents of plastics within the sample. These include the Thermo-Extraction-Desorption-Gas-Chromatography-MassSpectrometry (TED-GC-MS).
In many environmental samples, there are substances that interfere with both the sample detection and sample preparation. Thus, mineral components must be removed in order to be able to grind better. For their removal, density separation is suitable. In this article, experiments with density separation will be presented.
There are different options to prepare solid samples with density separation, including major methodological differences in the selection of the separation solution and the phase separation.
Various plastic spiked solid samples (terrestrial and sub hydric soils) were biologized. Subsequently, recovery tests were carried out using a density separation method with different separation solutions.
Ultrasound was used to destroy soil agglomerates and release occluded plastics. The separated floated material was sucked off through a 6 µm stainless steel filter. The plastic content in the rinsed organic material was quantified with a TED-GC-MS analysis.
The presented method shows medium (PE: 47 – 82 %) to high (PS: 89 – 100 %) recovery rates depending on the separation solution used and the environmental sample examined.