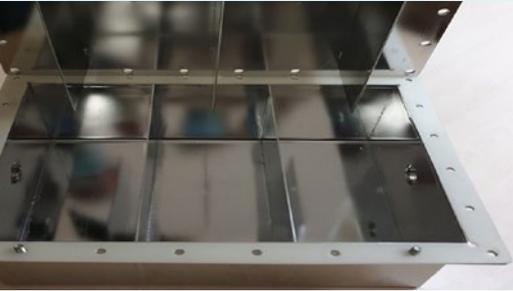


Sampling methodology for measuring microplastics: How to obtain a representative sample?



With the aid of a sedimentation box it is possible to sample over long periods of time and thus to separate larger quantities of solids [suspended matter] from the water phase. Its design leads to an abrupt enlargement of the cross-sectional area through which the water flow passes, which leads to a reduction of the flow velocity and thus to the sedimentation of [microplastic] particles.

Photo: © UBA

“Sampling concepts depend on the problem to be solved. Key factors are the particle occurrence, the detection method and the duration of the sampling.”

Dr. Claus Gerhard Bannick,
German Environment Agency (UBA)

Representative sampling is crucial for obtaining scientifically valid data on microplastics levels in the environment. This requires an approximate idea of the occurrence of microplastics in the medium under investigation. In the case of water bodies, this can be achieved, for instance, by means of sampling using a flow-through centrifuge. Integrated sampling over a longer period of time with a sedimentation box can take temporal fluctuations into account.

Representative sampling is a prerequisite for obtaining usable detection result

Sampling is possible in nature (e.g. water bodies), in plants (e.g. sewage treatment plants) or in stores (e.g. purchased bottled water). The first step is to determine the question to be answered, in order to develop an investigation concept containing details on the sampling requirements. Representative sampling is essential for the reliability of the test results. For this purpose, relevant characteristic carriers for the material to be analyzed and, depending on the analytical method, certain minimum content of microplastic particles should be presented in the sample. In order to meet these detection or determination limits, large sample volumes are sometimes required. This is particularly important in the case of low microplastic contents in the sampled medium.

The relevance of the microplastics' occurrence is assessed step by step

A special measuring filter crucible with a 5 µm stainless steel sieve has been developed to answer specific questions during sampling or in the context of sample preparation (e.g. filtration of supernatants from density separation of solids). With this, it is possible to transfer small particle quantities directly into the TED-GC/MS. In this way, even bottled water can also be sampled directly.



This measuring filter crucible is used for the filtration of very small particles and waters with very low total particle quantities and can be inserted directly into the detection device.

Foto: © BAM

Research on the type, quantity and inputs of microplastics and on how they can be avoided.

In the project „Representative Investigation Strategies for an Integrative System Understanding of Specific Inputs of Plastics into the Environment - RUSEKU“, practical sampling routines for mi-

croplastics are being developed. These should be representative and flexibly adaptable to different boundary conditions in order to be able to measure the microplastic content in water samples accurately and quickly. The focus is on sampling methods in urban wastewater systems and in flowing waters.

Possible applications for a newly developed measuring filter crucible

The decisive factor for an initial assessment of the occurrence of microplastics in different environmental media is the total content in the sample. This can

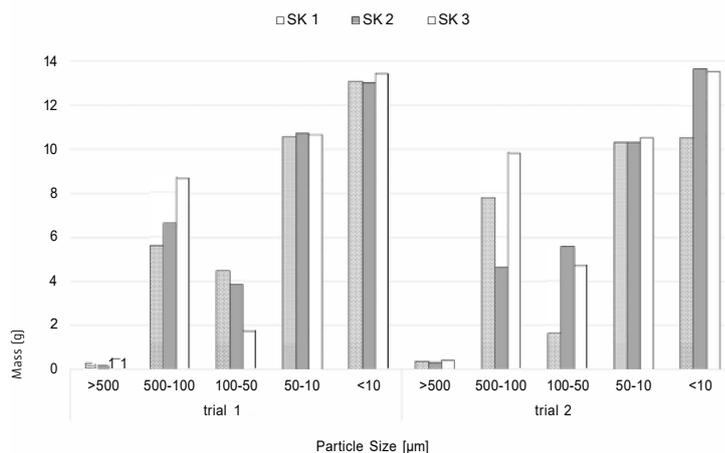
be reliably determined by thermoanalytical methods such as Thermal Extraction-Desorption-Gaschromatography-Mass Spectrometry (TED-GC/MS).

By means of fractionated filtration, it is also possible to assign the solids to specific size classes.



Use of pump-driven sedimentation boxes in a measuring station

Photo: © UBA



After fractionating, it is possible to depict the measures of particles deposited in sedimentation boxes according to their size distribution.

Fig.: © UBA

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