

# Microplastic contents in the environment

## Polymer mass determination using TED-GC/MS



To enable an assessment of the amount of microplastics in the environment, many different samples from all environmental areas, e.g. water, soil, air or biota, need to be analyzed.

Photo: © BAM

*„Scientists can detect mass contents of microplastics in the environment using complex detection methods such as TED-GC/MS.“*

Dr. Korinna Altmann, Federal Institute for Materials Research and Testing

Consumers are often unaware of the millions of tons of plastics that are improperly released into the environment. This may occur not only through improper disposal, but also as a result of the release of microplastics from tires or textiles or others. In the environment, the plastics break down into smaller particles through exposure to sunlight and/or water, and are dispersed by water or wind.

### The TED-GC/MS method is suitable for the analysis of real environmental samples

Various methods are available for measuring microplastics in the environment, which can determine the type of plastic, their composition, quantity, shape and size with varying degrees of accuracy. Only few of them can be used effectively at this stage. Since countless natural particles are present in an environmental sample in addition to microplastics, the challenge is to determine not only the type but also the quantities as accurately as possible. The method of ThermoExtraction/Desorption Gas Chromatography-Mass Spectrometry (TED-GC/MS), developed at the Federal Institute for Material Research and Testing (BAM), is particularly well suited for this purpose because representative sample quantities can be analyzed automatically in a routine procedure, often without the need for sample preparation.



The TED-GC/MS is a sophisticated instrument for the thermoanalytical determination of microplastics mass contents.

Photo: © BAM

## Research on the type, mass, input pathways and avoidance strategies of microplastics

The project „Representative Investigation Strategies for an Integrative System Approach to Specific Emissions of Plastics into the Environment-RUSEKU“ used TED-GC/MS measurements to sample various compartments such as water

bodies, a sewage treatment plant and washing machine water.

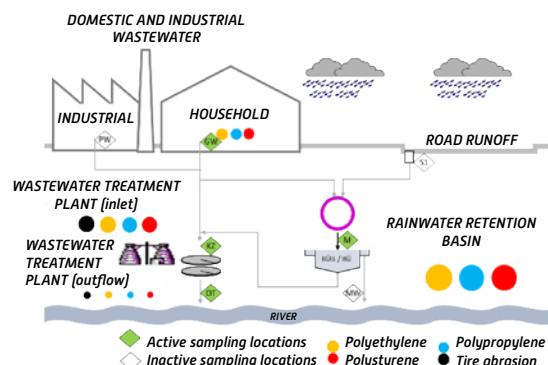
These analyses help to gain an understanding of plastic types, quantities, transport routes and input pathways of microplastics into the environment and to derive possible prevention strategies.

### What are the advantages of TED-GC/MS?

With TED-GC/MS, the sample extraction and the detection of the specific feature carriers are separated, which allows for representative sample quantities. An integral signal across all particle sizes is measured for polymers including tire abrasion. Time-consuming sample preparation to concentrate the plastic particles is rarely necessary, which helps to reduce the potential for contamination.

### Microplastics in urban wastewater system as an application example of TED-GC/MS

Microplastics were detected at various sites in the wastewater, with polyethylene, polypropylene, polystyrene and tire abrasion representing the most common types of industrially produced packaging as well as tire abrasion. The rainwater retention basin was identified as a possible input pathway, e.g. when unfiltered wastewater enters the environment during heavy rainfall events.



Sampling locations in the Kaiserslautern urban area – four different types of plastics were found in varying quantities

Figure: © Water Infrastructure Resources Institute TU Kaiserslautern 2020



This is what an environmental sample prepared for microplastics analysis in TED-GC/MS looks like.

Photo: © BAM

### IMPRINT

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