

# TURNING UP THE HEAT: A THERMOANALYTICAL APPROACH FOR THE DETECTION OF MICROPLASTICS

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## **Abstract**

Plastics are essential in our daily life. Their numerous advantageous properties have led to increasing consumers demand and production volumes. On the other hand, there are global challenges with unwanted inputs into the environment. Due to globally poor disposal practices, littering, insufficient waste and wastewater treatment and the regular use plastic products in the environment, millions of tons have entered and still enter the environment. Environmental stresses (i.e. UV irradiation, oxidation, hydrolysis, abrasion) fragment the polymeric products in particles smaller than 5 mm, colloquially called microplastics. Microparticles originated from thermoplastic and elastomeric materials are found in all compartments all over the world, especially in aquatic water systems.

To reduce possible impacts on the environment, sources, pathways and sinks need to be identified. Therefore, fast and high throughput analytical methods regarding sampling, sample preparation and measurement protocols are required. A recently developed, fully automated method, thermal extraction and desorption gas chromatography coupled with mass spectrometry (TED-GC-MS), meets most of these requirements. It is suited to quantitatively detect all relevant thermoplastics as well as an elastomer that can be used as marker substance for tire wear. Key features of this method are good reproducibility due to the use of an internal standard, high sample mass inputs granting representative results, low maintenance requirements and fast measurements with low limits of detection. In contrast to microscopic-spectroscopic methods, minor or even no sample pretreatment is necessary.

The present contribution demonstrates the methodological key parameters of TED-GC-MS as well as its application for water filtrate samples, generated by fractionated filtration of representative water volumes. Data from a waste water treatment plant, a surface water body and street run offs are presented exemplarily.

**Keywords:** Microplastics, TED-GC-MS