

We Make Microplastics Visible

Microplastics Finder by Purency

They are so small that you cannot see them with your naked eyes: microplastics. At sizes below 100 μm , our knowledge of plastic particles decreases rapidly and we are moving into a realm of speculation because the appropriate analytical methods are not yet in place.

Samples of water, sediment, soil, sewage sludge or food require great effort and carry a high degree of uncertainty, when analysed for microplastics. In practice, accurate and verifiable statements about specific particle types and their size distribution are currently hardly possible.

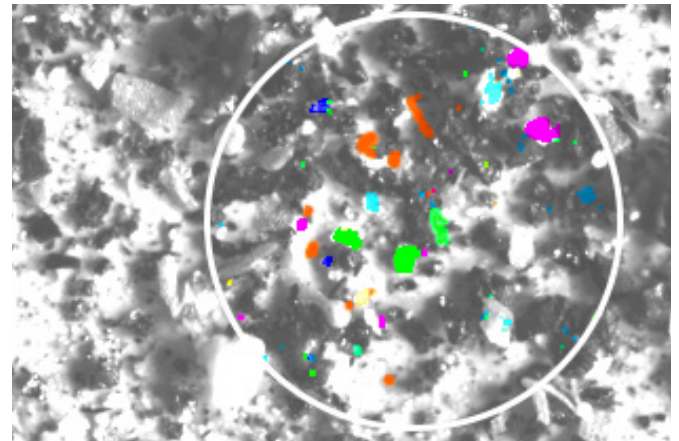
In recent years, various approaches have been pursued to enable the characterisation of microplastics in samples. FTIR imaging, based on so-called focal-plane-array detectors, has taken on a pioneering role. This allows samples to be measured quickly.

The challenge is to precisely analyse the measurement data of the samples and to reliably identify the existing microplastics. So far, database-based approaches have primarily been used for this purpose. However, these data analyses usually take several hours and require high manual effort. The results are difficult to compare, and detailed statements that are robust and verifiable can hardly be made.

Purency

During his studies in technical chemistry and chemical engineering at the TU Wien (the technical university in Vienna), PhD candidate Benedikt Hufnagl was able to acquire a thorough understanding of microplastics and data analysis. Together with two other TU Wien graduates and a business school graduate, he founded the company Purency GmbH. Purency's solutions for data analysis provide support to laboratories measuring microplastics.

The aim of Purency is to raise the analysis of microplastics to the level of routine analysis. Purency seeks to cooperate with laboratories that already analyse microplastics or intend to do so in the future, with spectrometer manufacturers, the food and beverage industry and environmental institutions.



The Microplastics Finder

The Microplastics Finder by Purency is a software that uses machine learning algorithms to automate the data analysis of microplastics measurements. It recognises the type, number and size of the particles. Large volumes of data are analysed - images with more than 1 million spectra and 5 GB each. For this purpose, conventional office PCs suffice.

The algorithms differentiate between more than 20 types of polymers. Each pixel of the image is classified according to its polymer type. The correct detection of particle sizes is dependent on the resolution of the measuring device in use. With FTIR imaging, for instance, the Microplastics Finder can individually detect, classify and count plastic particles down to a size of about 10 μm . The result of the analysis is a detailed table which clearly displays all existing polymer types according to particle size and quantity. The results are available within approximately 10 minutes.

Successful usage

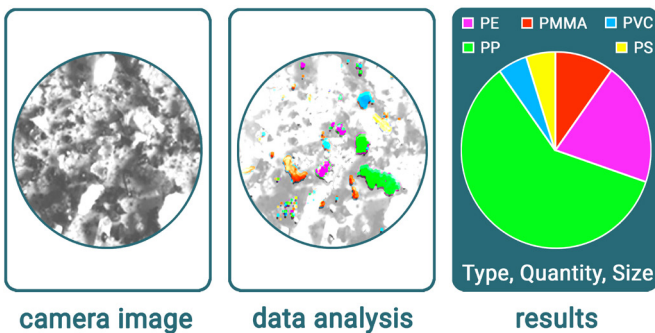
The Microplastics Finder by Purency was developed on the basis of practical challenges in environmental analysis and is continuously used in the working group of Prof. Dr. Christian Laforsch (University of Bayreuth). Its high efficiency and reliability has been proven for environmental samples from fresh and salt water, sediment, soil and sewage sludge.

Applications

- analysis of water, beverage and food samples
- environmental samples: fresh and salt water, sediment, soil, sewage sludge
- risk assessment, quality control, environmental monitoring

The Microplastics Finder by Purency is the ideal evaluation tool for sample measurements using FTIR imaging. Adjustments to other measurement methods could prove to be just as effective.

Workflow of a microplastics analysis



1. sample preparation: A series of treatments of the sample, e.g. with enzymes, causes a gradual degradation of the matrix, i.e. those components which are not microplastics. A gentle degradation of the matrix is necessary to prevent the dissolution of microplastics and thus the occurrence of measurement errors. Afterwards the sample material is applied to one or more filters for the measurement.
2. measurement: The sample is usually captured as a hyperspectral image, which contains the chemical information of the polymers present. This is accomplished using an FTIR imaging spectrometer. It involves scanning about 1 million pixels in the mid-infrared range and a camera image taken through a microscope.
3. data analysis: Purency's Microplastics Finder can assign each pixel of the hyperspectral image to a predefined polymer class. After the entire image has been processed, the size and quantity of the particles are detected per polymer type.

Benefits

The Microplastics Finder offers several key advantages over conventional manual and database-based methods of data analysis:

- **highest quality:** no need for time-consuming manual post-processing by experts; bias introduced by manual assessments is eliminated
- **high reliability and traceability:** repetition of analyses leads to the same results; each plastic particle can easily and clearly be identified in the microscopic image
- **clear presentation of results:** comprehensive table containing all particles and their properties; polymer types are differentiated by colour; clear and easily comparable summary in a few rows
- **wide versatility:** robust analysis results for a wide range of matrices, including very polluted environmental samples such as sewage sludge
- **increased time savings:** time spent on data analysis reduced from hours or days to approximately ten minutes
- **high cost savings:** automatic analysis without time-consuming post-processing; experts can focus on other tasks; considerably increased sample throughput

Contact

Dipl.-Ing. Michael Stibi
 TU Wien – Innovation Incubation Center
 c/o Purency GmbH
 Floragasse 7/ 7
 1040 Vienna, Austria, Europe
www.purency.ai, tuwien.at/analytica2020
info@purency.ai