Federal Ministry of Education and Research

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RUSEKU – Precise Detection of Microplastics in Water

Plastics in the Environment –Sources · Sinks · Solutions

It has been observed for over 40 years now that plastics accumulate in the environment. But how do these plastics, and in particular their tiny decomposition products – microplastics – enter water bodies and wastewater? Reliable data on sources, pathways and effects on humans and the environment are still missing. The joint research project RUSEKU seeks to develop representative test methods that can accurately and quickly determine the microplastic content over various parts of the water cycle. The focus is on sampling methods in urban wastewater systems and watercourses.

Sampling as a Basis for High Quality Data

Microplastics in the environment occur in various forms: particles, fibers and film. They predominately originate from the decomposition of thermoplastic materials (materials that can be deformed under heat) by UV radiation, aging or mechanical stress. The distribution of plastic particles is extremely varied based upon the environmental media, such as water, soil or air. Also, the particles ultimately tend to accumulate in water bodies.

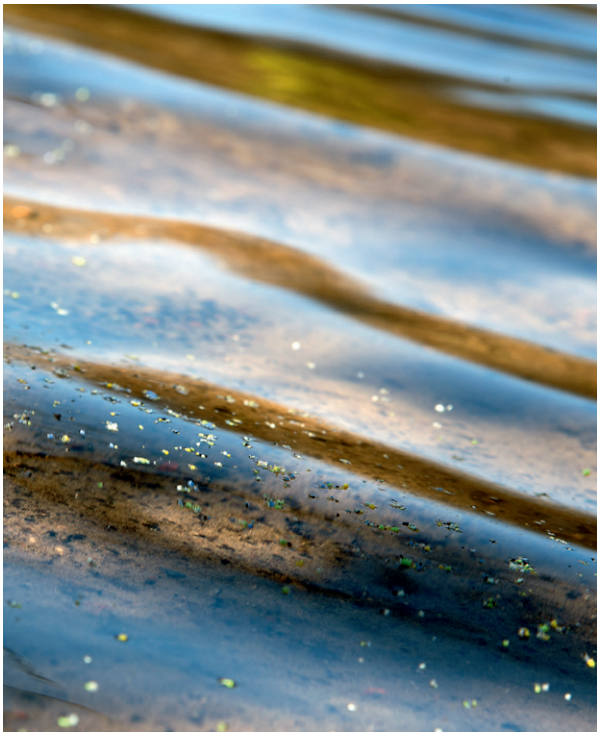
The sources, transport pathways, accumulation points, and overall loads of these microplastics in water remain unknown. Sampling is currently not standardized and therefore results are extremely varied. Existing, frequently used sampling methods, such as plankton nets are not suitable for urban areas or watercourses. The aim of the joint research project RUSEKU is to develop a reliable and practical method for water sampling across the different sections of the water cycle that is adapted to microplastic analysis. In this way, data can be systematically collected and compared. These results are an important prerequisite for preventing future microplastic emissions into water bodies.

Real-world Test in Urban Wastewater System

In order to develop new analytical methods, the researchers are first producing microplastic particles with varying properties, shapes, and sizes. The focus is on film fragments and particles from packaging, as well as fiber from textile products, because these are significant sources of microplastics in the environment. In order to fabricate realistic plastic particles, these are subjected to weathering processes, such as UV radiation and oxidation. In the laboratory and in simulation plants, the project partners are evaluating which methods can be used to detect the particles in samples quickly and reliably.

The various methods used are being further developed within the project: a suspended matter trap, a cascade filtration plant with innovative filters and metal meshes with mesh sizes less than 10 micrometers.

Next, the researchers are testing the suitability of the optimized sampling methods in real wastewater systems in Kaiserslautern. They want to determine the significance of individual entry points into the wastewater system, select suitable and representative places and times for sampling, and estimate the occurrence and loads of microplastics in the entire urban water cycle.



Microplastics are increasingly found in surface waters.

RUSEKU

Eine Initiative des Bundesministeriums für Bildung und Forschung
Plastik in der Umwelt
Quellen • Senken • Lösungsansätze

Market-Ready Methods for Microplastic Sampling

In addition, the project team will quantitatively predict the movement and distribution of microplastic particles in watercourses and the wastewater system. The project partners will integrate the results into a software that simulates complex, application-oriented cases. For this purpose, a commercially usable simulation code will be developed that limits the selection of suitable sampling points. At the end of the project, a market-ready procedure for efficient and reliable microplastic sampling should be in place. This is intended to simplify the evulation of questions regarding microplastics for legislators and to provide a basis for strategies and regulations that help to reduce microplastics in the water cycle.

Flow and pond simulation facility of the German Environment Agency in Marienfelde

Research Focus
Plastics in the environment – Sources • Sinks • Solutions

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