**Microplstics as Source and Sink for Organic Contaminants in Freshwater Systems**

Sascha Klein1, Eckhard Worch2, Thomas P. Knepper1

1 Hochschule Fresnius, Institute for Analytical Research, Limburger Straße 2, 65510 Idstein,

[sascha.klein@hs-fresenius.de](mailto:sascha.klein@hs-fresenius.de)

2 TU Dresden, Institut für Wasserchemie, 01069 Dresden

Plast debris is one of the most significant pollutant in the aquatic environment. Because of properties such as buoyancy and extreme durability, synthetic polymers are present in rivers, lakes and oceans and accumulate in sediments all over the world.1 Especially the considerable occurrence of small plastic particles, so-called microplastics (size <5 mm), has recently attracted attention of scientists.

The hydrophobic character of many synthetic polymers is assumed to favor sorption of organic contaminants to the polymer particles. If present in the aquatic systems, this can lead to an enrichment of contaminants on the particle surfaces compared to the surrounding water by several orders of magnitude. If ingested by animals, these plastic particles can possibly act as carriers and transport the organic contaminants into the organism.2

For deeper insights into the sorption process of organic contaminants to polymers in aqueous systems, batch experiments in synthetic fresh water were conducted to determine sorption kinetics and sorption isotherms for 4 selected glass state polymers and 3 different model substances. All substances (carbamazepine, lindane, chlorpyrifos) showed sorption to the polymer particles (polycarbonate, polymethyl methacrylate, polystyrene, polyvinyl chloride) increasing with the KOW values of the contaminants. Furthermore, influences of the different polymer types used were observed in the experiments.

To estimate the environmental relevance of contaminant sorption, microplastics were seperated from river shore sediments of the Rhine-Main area in Germany. Plastic particles made of polyethylene and polystyrene were the most abundant in mass and number, respectively. These particles were extracted and analyzed by GC/MS, LC-MS/MS and LC-orbitrap using target screening methods and non-target approaches. Different pesticides were identified in the polymer particles suggesting that microplastics can act as a sink for hydrophobic contaminants. Moreover, several plastic additives such as phthalates or chlorinated flame retardents were identified. For this reason, it is very likely that microplastics act as a direct source for these chemicals in aquatic systems, stressing the urgency for the mitigation of the plastic particles in the aquatic environment.

1. Klein, S.; Worch, E.; Knepper, T. P., Occurrence and Spatial Distribution of Microplastics in River Shore Sediments of the Rhine-Main Area in Germany. Environmental Science & Technology 2015, 49, (10), 6070-6076.

2. Bakir, A.; Rowland, S. J.; Thompson, R. C., Enhanced desorption of persistent organic pollutants from microplastics under simulated physiological conditions. Environ. Pollut. 2014, 185, 16-23.