
Microplastics in the Hamburg port area – An analysis of sediments from the upper tidal Elbe

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Abstract

Harbors pose an unique environment of increased anthropogenic pressure and artificial river morphology that are of specific interest concerning microplastic release and accumulation. To address the specific situation in the Hamburg port area we conducted a study in cooperation with the Hamburg Port Authority (HPA). Sediment samples in depth profiles were taken at seven sites with similar flow velocity and underlying morphology. Two sites are located upstream and downstream of the port of Hamburg, while four sites are located in the center area of the port. One additional site takes into account an estuary of a receiving stream flowing into the Upper river Elbe.

For the analysis of microplastic concentrations in the samples, the biogenic organic matter was removed by digestion (H₂O₂ 10% and NaClO 6-14%) followed by wet sieving and a density separation with NaI (density: 1.5 - 1.6 g/cm³). For identification the Nile red staining method in combination with fluorescence microscopy (AxioLab A.1, Zeiss, TRITC HC Filterset (AHF), 2.5x) was applied. A subset of 101 identified synthetic polymers was investigated for polymer composition via μ Raman spectroscopy (DXR2xi Raman Imaging Microscope, Thermo Fisher Scientific).

A total number of 31 sediment samples divided into different depths below riverbed level were examined. Detailed results of sites and depths concentrations, morphologies and polymer composition will be presented during the conference. In brief, 11,280 microplastic particles could be found in total. Both the highest and lowest number of particles were detected at center port sites ranging from 60 to 21,799. Fragments are the dominating particle morphology throughout all locations, except for one center harbor site where microbeads are most common. Most common synthetic polymers were detected to be PVC (34 %) and PET (28 %).

Keywords: harbor, sediment, river, flow velocity, density separation, nile red, Raman

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