

Hochschule für Technik und Wirtschaft Dresden University of Applied Sciences





Microplastic detection and distribution in sediments from the Elbe River

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Microplastic Monitoring in the Riverine Environment

Routine MP monitoring could fail due to a lack of suitable methods

Electrostatic separation + DSC for MP analysis in sediments

– Fast

Low cost of investment

– Cost-efficient

– Easy to implement in laboratories world wide



Sampling of River Sediments



Fig. 2: Overview of the 43 sampling sites along the Elbe River

Sampling of River Sediments



Differential Scanning Calorimetry (DSC)^[5]



Using DSC to Detect MP in Elbe River Sediments



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Using DSC to Detect MP in Elbe River Sediments ^[6]



MP detection in 25 out of 43 sediment samples

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[6] Kurzweg et al.: Microplastic Analysis in Sediments of the Elbe River by Electrostatic Separation and 7 Differential Scanning Calorimetry. Sci. Total Environ. 2024, 930, 172514.

MP Distribution in the Elbe River ^[6]



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[6] Kurzweg et al.: Microplastic Analysis in Sediments of the Elbe River by Electrostatic Separation and Differential Scanning Calorimetry. Sci. Total Environ. 2024, 930, 172514.

MP Distribution in the Elbe River^[6]



Differential Scanning Calorimetry. Sci. Total Environ. 2024, 930, 172514.

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Investigating the Settling of Polyethylene MP

Polyethylene (LDPE) was found in sediments despite is low density

New reference material to investigate settling in riverine environment



Fig. 6: MP reference materials produced by micro-extrusion

Performing aggregation and settling experiments

in laboratory conditions



in environmental conditions



Fig. 7: Setup for settling and aggregation experiments in the laboratory and in the environment

Conclusion

– A fast and reliable method for MP detection was successfully tested

- Application of electrostatic separation according to d_{10}
- Fast enrichment of dry samples and reduction unsage of saline solution for DS

– 43 sediment samples investigated by DSC

- MP in 58 % of the samples detected
- MP content: 0,2 und 44,6 mg/kg
- Harbour basins are potential MP sinks
- Combination of ES and DSC: hight potential for MP monitoring in particulate samples





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Thank you!

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Diese Maßnahme wird mitfinanziert durch Steuermittel auf der Grundlage des vom Sächsischen Landtag beschlossenen Haushaltes.



Appendix

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Enrichment of MP in Sediment Samples^[4]



Fig. 3: Scheme of MP enrichment by electrostatic separation and density separation

	Mass reduction of enriched sample					
	Electrostatic sep. > 80 %			Density sep.:		
Sampling		Enrichment		Analysis	<u> </u>	Distrik

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[4] Kurzweg et al.: Application of Electrostatic Separation and Differential Scanning Calorimetry for Microplastic Analysis in River Sediments. Front. Environ. Sci. 2022, 10, 1032005. https://doi.org/10.3389/fenvs.2022.1032005.

MP detection by DSC

Limits of quantification for different polymers by DSC

