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HORIZON-MISS-2022-OCEAN-01-03: Mediterranean Sea Basin Lighthouse - Actions to Prevent, Minimize and Remediate Chemical Pollution (iMERMAID). Use Case 5: Demonstration of Innovative Solutions for the Removal of Organic Contaminants from Landfill Leachate.

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Abstract

Use Case 5 of the iMERMAID project evaluated innovative technologies for the monitoring and remediation of organic micropollutants in municipal solid waste landfill leachate under real operating conditions. Landfill leachates contain a wide range of contaminants of emerging concern (CoECs), including persistent organic pollutants and heavy metals, many of which are not effectively removed by conventional treatment technologies.

The demonstration focused on assessing an integrated approach combining advanced remediation technologies, real-time monitoring, and ecotoxicological assessment. The pilot was conducted at the leachate treatment plant of the Pera Galini Sanitary Landfill in Crete, Greece, where four innovative technologies were deployed: (i) the AKVO microfluidic remediation system for the degradation of three target organic micropollutants—bentazone, propamocarb, and bisphenol A; (ii) the Electrochemical Sensor Box 2 for on-site, real-time monitoring of the same target compounds; (iii) a portable electrochemical sensor for automated detection of perfluorooctanoic acid; and (iv) the Heavy Metal Box for online monitoring of Cd, Pb, Cu, and Zn. In parallel, a battery of toxicity assays was performed to evaluate the environmental impact of the treatment.

The pilot confirmed the technical feasibility of integrating advanced remediation with real-time monitoring for landfill leachate management under field conditions. While the complex leachate matrix limited the efficiency of photocatalytic degradation, the sensor platforms demonstrated reliable operation and highlighted their potential for continuous environmental monitoring. Overall, the study provides valuable insights into the performance of remediation and monitoring technologies and identifies key areas for improving remediation efficiency, sensor robustness, and automated monitoring of complex wastewater streams.

Keywords: landfill leachate, contaminants of emerging concern, electrochemical sensors, real-time monitoring, microfluidic remediation

References

https://imermaid.eu/
https://www.esdak.gr/

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