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Platinum distribution and bioaccumulation in estuarine/coastal systems

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Continuously increasing mining, use and release of Technology Critical Elements (TCE) pose growing concerns regarding their environmental dispersion, fate, and ecotoxicology. Among them, platinum (Pt) is an emerging contaminant applied in various applications, including car catalytic converters as well as in anti-cancer drugs. Environmental Pt levels, its behaviour and reactivity remain widely unknown in estuarine/coastal environments that are under high anthropogenic pressure. Analytical challenges in terms of sensitivity and interference control required for Pt ultra-trace detection in marine matrices may explain such general lack of information. The inexistence of Certified Reference Materials is an additional problem. The present work presents Inter-comparison and validation of optimised Adsorptive Cathodic Stripping Voltammetry (Ad-CSV) and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) methods for Pt measurements in marine organisms. Field monitoring studies on Pt biogeochemistry have been performed in key estuarine/coastal European systems, including Pt distribution in seawater, suspended particles, and living organisms. In particular, spatial biomonitoring from contrasting areas along urbanized coastlines suggests a relation between the degree of “urban exposure” and Pt concentrations in marine organisms. While wild bivalves prove to be good biomonitors of Pt contamination, Pt in coastal water may have the potential to serve as a tracer of modern urban (medical, traffic) sources. Field observations also suggest that biogeochemical processes leading to changes in Pt partitioning and carrier phases at short temporal scale may enhance its bioavailability, including in algae, and ultimately induce toxic effects on marine organisms. Bioaccumulation of emerging metallic contaminants such as Pt and other TCEs in aquatic organisms may be used as integrative tools in environmental monitoring and ecotoxicological assessment.