STUDY OF PROBLEMATIC RESULTS OF LEAD DETERMINATION IN ENVIRONMENTAL OBJECTS USING MICROWAVE PLASMA ATOMIC EMISSION SPECTROMETRY

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Lead, a toxic heavy metal, pervades numerous natural ecosystems, including the atmosphere, hydrosphere, and even the food chain. Its widespread presence underscores the critical need to accurately quantify lead content for the sake of monitoring environmental contamination, safeguarding public health, and evaluating potential threats to ecosystems. Quantifying lead concentrations is an invaluable tool for regulatory agencies, permitting the establishment of safe concentration thresholds. Furthermore, concentration quantifications facilitate the identification of pollution sources, enabling the meticulous planning of appropriate mitigation strategies. Precise measurements of lead concentrations are crucial in ensuring dependable scientific investigations, formulating efficacious policies, and augmenting our understanding of lead-associated hazards [1,2].

Lead quantification, however, is plagued by several challenges, including matrix interferences, detection limit issues, analytical sensitivity issues, sample preparation intricacies, potential contamination of samples during sample preparation step, calibration inaccuracies, and background noise.

The primary objective of our research was to scrutinize these problematic aspects of lead determination in various environmental matrices, such as water and soil. To this end, we employed a Microwave Plasma Atomic Emission Spectrometer, a versatile analytical tool in environmental science. Leveraging a diverse set of experimental data, we not only determined the lead concentrations in these environmental matrices but also addressed the aforementioned challenges. To ensure reliable lead determination, we fine-tuned specific parameters on the analytical instrument. In an attempt to augment the reliability of our results, we concurrently performed analyses using a Flame Atomic Absorption Spectrometer and an Inductively Coupled Plasma Mass Spectrometer. These methodologies cross-validated our findings and added robustness to our research.

The accurate quantification of lead concentration is an indispensable component of environmental surveillance, as well as public health and safety assurance. This accuracy paves the way for the enforcement of appropriate regulations. Moreover, the results facilitate informed decision-making, thorough risk assessment, and the enactment of preventive measures. Such actions contribute substantially to curtailing lead exposure, thus minimizing its deleterious effects on human health and the environment. As we continue to perfect our methodologies and expand our understanding of environmental footprint of lead, we contribute to the broader goal of creating a safer and healthier world.

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