World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:18, No:02, 2024

Method Validation for Heavy Metal Determination in Spring Water and Sediments

Authors : Habtamu Abdisa

Abstract : Spring water is particularly valuable due to its high mineral content, which is beneficial for human health. However, anthropogenic activities usually imbalance the natural levels of its composition, which can cause adverse health effects. Regular monitoring of a naturally given environmental resource is of great concern in the world today. The spectrophotometric application is one of the best methods for qualifying and quantifying the mineral contents of environmental water samples. This research was conducted to evaluate the quality of spring water concerning its heavy metal composition. A grab sampling technique was employed to collect representative samples, including duplicates. The samples were then treated with concentrated HNO3 to a pH level below 2 and stored at 4oC. The samples were digested and analyzed for cadmium (Cd), chromium (Cr), manganese (Mn), copper (Cu), iron (Fe), and zinc (Zn) following method validation. Atomic Absorption Spectrometry (AAS) was utilized for the sample analysis. Quality control measures, including blanks, duplicates, and certified reference materials (CRMs), were implemented to ensure the accuracy and precision of the analytical results. Of the metals analyzed in the water samples, Cd and Cr were found to be below the detection limit. However, the concentrations of Mn, Cu, Fe, and Zn ranged from mean values of 0.119-0.227 mg/L, 0.142-0.166 mg/L, 0.183-0.267 mg/L, and 0.074-0.181 mg/L, respectively. Sediment analysis revealed mean concentration ranges of 348.31-429.21 mg/kg, 0.23-0.28 mg/kg, 18.73-22.84 mg/kg, 2.76-3.15 mg/kg, 941.84-1128.56 mg/kg, and 42.39-66.53 mg/kg for Mn, Cd, Cu, Cr, Fe, and Zn, respectively. The study results established that the evaluated spring water and its associated sediment met the regulatory standards and guidelines for heavy metal concentrations. Furthermore, this research can enhance the quality assurance and control processes for environmental sample analysis, ensuring the generation of reliable data.

Keywords : method validation, heavy metal, spring water, sediment, method detection limit
Conference Title : ICEWRM 2024 : International Conference on Environment and Water Resource Management
Conference Location : Washington, United States
Conference Dates : February 26-27, 2024