HEAVY METAL CONTAMINATION AND HEALTH RISK ASSESSMENT IN WASTE MINE WATER DEWATERING USING PHOSPHATE BENEFICIATION PROCESSES IN JORDAN

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The main objective of study was to determine the degree of heavy metal contamination in Washing Mine Water of phosphate bed A1 (WMW A1) and Flotation Mine Water of phosphate bed A3 (FMW A3), and to assess the possible health risks associated with oral daily intake and dermal absorption skin of mine water effluents from phosphate mining process. Results showed that the average concentrations of Cd, Cr, Li, Mn, Mo, Ni, Pb, U, Ti, V, and Zn were below the required standard. The contamination index indicated that both mine waters showed slightly low contamination at mine sites, this indicates low raw phosphate inputs from phosphate mining activities. The mean concentrations of Mn and Cr were higher in mine water compared to stream water surface water, waste water, and industrial water. Multivariate statistical analyses including factor analysis and cluster analysis results revealed that natural input from phosphate raw materials was the main source of mine water contamination. The health risk assessment showed that hazard quotient (HQ) and Hazard index (HI) values were <1, indicating non-carcinogenic risk through daily intake and dermal exposure pathway in mine water. The daily intake (DDI) were V>Cr>Ni>Zn>U>Mn>Cd>Pb>Ti in WMW-A1, respectively, and Mn>Cd>V>Ni>Zn>Cr>U>Ti>Pb in FMW-A3, respectively. The Carcinogenic risk for Pb was lower than the acceptable risk of 1:10,000 for regulatory purposes. In long term use, the results showed that the mine water of the Phosphate beneficiation waste processing in Eshidiya mine is contaminated with heavy metals that might affect human health as well as the health of the ecosystem.