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VERTICAL DISTRIBUTION AND POTENTIAL MOBILITY OF HEAVY METALS IN NEW AND OLD TAILINGS OF A LEAD/ZINC SULFIDE MINE

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Abstract

Sulfide bearing mine tailings generated through mining and processing of mineral ores is one of the serious problems around the world due to their potential environmental hazards. Current study focuses on vertical distribution and potential mobility of metals in New and Old tailings of a Lead and Zinc mining area of India. Mine tailing profiles sampled from New (0-500mm) and Old tailing (0-400mm) dams were chemically (pH, EC, Carbonate content, Cd, Pb, Zn and Mn levels) and mineralogically (using X-ray Diffraction) characterized. Both the New and old tailings are alkaline having high carbonate content. However, the pH of old tailings is less than the New tailings. The vertical profile distribution of metals in new tailings indicate a decrease in Pb levels with depth upto 200 mm and a substantial increase in Zn and Cd levels were noted below 200 mm depth. However, no differences were observed for Mn levels with depth. In case of Old Tailings, no discernible pattern for Cd, Pb, Zn and Mn levels with depth was observed. These chemical and mineralogical observations confirm that the new tailings are undergoing oxidation and weathering in the surface layers, however, the old tailings are sort of stabilized at least upto sampling depth. To estimate the potential mobility of Cd, Pb and Zn in New and Old tailings, single extraction (EDTA 0.05 mol/L) was applied to surface tailings. The correlation coefficients between total and EDTA extractable Cd and Zn (r values for Cd and Zn being 0.965 and 0.976, respectively, and P value being 0.001) indicate statistically significant relation. The results of EDTA extraction show that out of the three metals, Pb has maximum extractability in new tailings, whilst Cd has the maximum mobility in old tailings, and Zn has the least potential mobility in both types of tailings.

Key words: Correlation coefficient, Heavy metal, Mine Tailing, Single extraction, Vertical distribution

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