Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35657

Column tests to assess the geochemical stability of weathered acid-generating tailings

MRS. FARIDAH A LANKOANDE[1], BENOÎT PLANTE[1], ISABELLE DEMERS[2] AND THOMAS PABST[3]

[1]Université du Québec en Abitibi-Témiscamingue (UQAT)
[2]University of Québec in Abitibi-Témiscamingue (UQAT)
[3]Norwegian Geotechnical Institute

The reclamation of weathered acid-generating tailings presents many challenges. For example, after reclamation with oxygen barriers methods, secondary minerals such as iron oxyhydroxides accumulated in weathered mine tailings can be dissolved (releasing ferric ions), making the drainage water more contaminated than without the cover. The objective of this study is to assess, through kinetic laboratory tests, the impact of geochemical stabilization of weathered mine waste on the quality of leachate with or without reclamation with a capillary barrier cover (CCBE). Four columns were installed in the laboratory: two control columns and two columns with an initial treatment of 1 mol/L of sodium metasilicate as a passivating agent. The columns were rinsed with deionized water for 16 monthly cycles. Secondly, a CCBE was installed on all the columns after the electrical conductivity of the leachate stabilized at less than 10 mS/cm (before flush 8). Leachate analyses performed by ICP-AES revealed that the incorporation of metasilicate as a passivating agent reduced the concentration of calcium (momentarily) and magnesium (2 times less than the control) in the leachates. Iron concentrations were less than 1.5 mg/L due to neutral to basic pH. In columns where sodium metasilicate was used, sulphate levels were considerably higher, suggesting the dissolution of secondary sulphate minerals such as gypsum. In addition, the reducing conditions provided by the CCBE did not impact the geochemistry of the mine tailings. This observation could be explained by the geochemical stability of the weathered tailings after the first flush that leached the soluble elements. These results provide answers that can be optimized for a more efficient passivation of weathered tailings.