

Use of mining materials in covers to reclaim acid-generating mine sites

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The sustainable management of mine waste disposal areas is a challenge that requires efficient, cost-effective, and durable solutions. Reclamation scenarios often need to address the generation of acid mine drainage (AMD) from the mine wastes, which is created when sulfide minerals react with water and oxygen. Engineered mine covers are used to control AMD by limiting water and/or oxygen migration, or by controlling the temperature of the mine waste in cold climatic conditions. Constructing engineered covers requires large quantities of natural materials that must usually either be transported from distant production sites or borrowed from the local area, with the risk of further disrupting the surrounding environment.

Recently, non-reactive tailings, desulfurized tailings, non acid-generating and acid-generating waste rock have been proposed as alternatives to natural materials to build engineered mine covers. The valorization (or re-use) of these materials offers a financial advantage and can potentially reduce the environmental footprint of a mine. In the following, results from different recent studies performed with mining materials from existing Canadian sites are presented. Different types of covers were tested: covers with capillary barrier effects, monolayer covers with elevated water table and insulation covers. These covers were tested in the lab and in the field at an intermediate or real scale. Results showed that mining materials can replace natural soils in engineered covers for all conditions tested. Waste rocks have appropriate unsaturated properties for being used as capillary break/support layer and as evaporation barrier while tailings have advantageous properties for being used as moisture-retaining layer. Tailings are also not significantly affected by freeze-thaw cycles due to their self-healing potential.