

Tailings-Based Engineered Barriers for Waste Containment

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Abstract

The mining industry is a global activity that plays an important role in the economies of many countries around the world. However, underground and surface mining operations as well as mineral processing activities produce a large amount of solid waste, such as tailings. Tailings are a by-product of mining. It is the processed rock or soil that remains after the valuable products have been separated from the rock or soil in which they are found. In most cases, tailings are reputed to be hazardous for the environment, health and economy.

Tailings are traditionally stored in tailings disposal facilities (e.g., dams, ponds, and other types of surface impoundments) located on the surface of the mine, using a variety of methods. However, degradation and/or failure of the aforementioned tailings disposal facilities can result in serious environmental and geotechnical problems, with significant social and economic ramifications. These risks and consequences associated with conventional tailings ponds, the enormous costs of operating and maintaining these ponds, public perception, and more stringent regulations regarding the disposal of these tailings have prompted the mining industry and the engineering community to develop new tailings management strategies that are expected to be environmentally sound and cost effective, as well as to establish new methods of recycling tailings into construction materials. In this scenario, recycling of tailings into construction materials is gaining popularity in many parts of the world. The use of tailings to create and construct engineered barrier (liner, cover) for waste containment is one of the most innovative methods of turning tailings into construction materials developed in recent years. Engineering of waste containment facilities, such as landfills, mine waste repositories and containment facilities for industrial (e.g., oil, gas, chemicals) and other hazardous wastes, usually requires the construction of a barrier (liner, cover). The liners are usually needed to minimize the downward flux of contaminants, while the covers generally limit the accessibility of fluid (e.g., rainwater) into the waste. The barrier will drastically reduce the potential impact of waste disposal on the environment (e.g., groundwater, surface water, and ecosystem).

In the past years, extensive research has been conducted at the University of Ottawa (Canada) to develop and assess of various engineered barriers materials made of tailings. In the present keynote, successful techniques of turning tailings into liners and cover for waste containment facilities will be presented and discussed. An insight into the material composition, preparation, design criteria and performance of the different types of tailings-based engineered barrier materials developed will also be given.