

Revegetation of Acid Rock Drainage (ARD) Producing Slope Surface Using Phosphate Microencapsulation and Artificial Soil

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Oxidation of sulfides produces acid rock drainage (ARD) upon their exposure to oxidation environment by construction and mining activities. The ARD causes the acidification and metal contamination of soil, surface water and groundwater, the damage of plant, the deterioration of landscape and the reduction of slope stability. The revegetation of slope surface is one of commonly adopted strategies to reduce erosion and to increase slope stability. However, the revegetation of the ARD producing slope surface is frequently failed due to its high acidity and toxic metal content. We developed a revegetation method consisting of microencapsulation and artificial soil in the laboratory. The revegetation method was applied on the ARD producing slope on which the revegetation using soil coverage and seeding was failed and monitored the plant growth for one year. The phosphate solution was applied on sulfide containing rock to form stable Fe-phosphate mineral on the surface of sulfide, which worked as a physical barrier to prevent contacting oxidants such as oxygen and Fe³⁺ ion to the sulfide surface. After the microencapsulation, two artificial soil layers were constructed. The first layer containing organic matter, dolomite powder and soil was constructed at 2 cm thickness to neutralize the rising acidic capillary water from the sub-surface and to remove the dissolved oxygen from the percolating rain water. Finally, the second layer containing seeds, organic matter, nutrients and soil was constructed at 3 cm thickness on the top. After application of the method, the pH of the soil below the artificial soil layer increased and the ARD production from the rock fragments reduced. The plant growth showed an ordinary state while the plant died two month after germination for the previous revegetation trial. No soil erosion occurred from the slope during the one year field test.