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EFFECT OF INDUSTRIAL BY-PRODUCTS AND pH ELEVATION ON HEAVY METAL REMOVAL FROM ACID MINE DRAINAGE

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Abstract

Wastewater produced in the mining industry, so called acid mine drainage, is typically very acidic and high in dissolved metals and, thus, poses serious environmental risks. Wastewater treatment is traditionally done by using manufactured chemicals which is neither environmentally nor economically sound. The use of industrial by-product geomaterials is a low-cost alternative method as these materials are anyway produced in other industries. In wastewater treatment with geomaterials, the heavy metal removal mechanism is based on precipitation and surface adsorption which are highly pH dependent.

In this study, acidic multimetal wastewater from Talvivaara mine was treated with three solid byproducts (steel slag, apatite mine tailings and Sachtofer PR) of Finnish industries; and the effect of geomaterials and incubation time on heavy metal removal from the wastewater were studied. Waste water was incubated with the geomaterials for 1, 7 and 21 days. To equalize the pH in different treatments after incubation, pH of all the samples was raised to 7. Concentrations of iron, aluminum and nickel were measured with ICP-OES, at the beginning of the experiment and after pH rise. As expected, elevating pH was the driving factor for element removal. Among the used solids, steel slag showed the best results in element removal. It removed all or virtually all dissolved iron, aluminum and nickel from the wastewater. Tailings and Sachtofer PR showed poor results regarding heavy metal removal from the solution.

Keywords

Acid mine drainage (AMD), Wastewater treatment, Heavy metals, Geomaterials, Steel slag, Tailings, Sachtofer PR