



Nanofiltration of acid mine drainage

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ABSTRACT

Acid mine drainage (AMD) is recognized as one of the more critical environmental problems in the mining industry, with the potential of severe contamination of surface and groundwater, as well as soils. Different conventional methods are used to treat AMD such as lime neutralization, in which lime is added to AMD to raise pH and then precipitate the dissolved toxic heavy metals. In addition to a high concentration of sulphate, the sludge produced by this process has no economic value and has to be disposed of in large areas of land. Nanofiltration (NF) membranes are a new alternative method employed to treat AMD in this work. First, neutralization of AMD collected from the copper mine in Chile using both sodium hydroxide and lime will be investigated to find the optimum formed sludge. Then, three commercial NF membranes (NF99, DK, GE) have been used to filter AMD at two different pressures of 20 and 30 bar and at two different concentrations. The results showed that NF membranes successfully treated AMD with a very high rejection (>98%) of heavy metals. This indicates their suitability in treating this type of wastewater in a more environmentally friendly process. The DK membrane had the highest rejection even at low studied pressure (20 bar) and high AMD concentration. Meanwhile, NF99 had the highest flux, yet its rejection was slightly lower than the DK membrane, especially at the latter condition. Finally, the GE membrane had the lowest rejection and flux at all studied conditions. Further study is required to address the scaling effects on the membrane surface.

Keywords: Acid mine drainage; Nanofiltration; Membrane; Lime; Neutralization; Scaling

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