

Integrated treatment of acid mine drainage using BOF slag, lime/soda ash and reverse osmosis (RO): Implication for the production of drinking water

Masindi, Vhahangwele
Osman, Muhammad S
Abu-Mahfouz, Adnan MI

ABSTRACT:

Acid mine drainage has been an issue of prime concern to international scientific communities. This is due to the magnitude, nature and extent of its environmental impacts. Acid mine drainage (AMD) contains hazardous and toxic chemical species that require removal prior discharging mine water to different environmental compartments. A number of mine water treatment technologies have been developed but they were reported to contain certain benefits and drawbacks. However, there is a need to come-up with environmental friendly and zeroliquid-discharge technologies. The purpose of this novel study was to produce drinking water and recover valuable minerals from acid mine drainage using an integration of Basic Oxygen Furnace (BOF) slag, lime, soda ash and Reverse Osmosis (RO) system. The process can produce very pure water and recover valuable minerals such as hematite, goethite, gypsum, and limestone. Furthermore, brine will be taken to free desalinators for further recovery of salts. To achieve the goals of this study, semi-pilot experiments were done in the laboratory using the aforementioned integrated approach. Interaction of BOF and AMD increased the pH of mine water to ≈ 8 . > 99% metals and 75% sulphate were also removed using BOF slag. Residual sulphates and hardness were reduced using lime and soda ash respectively. Gypsum and brucite were recovered as valuable minerals in the lime reactor. Ca as hydrated lime and limestone were recovered in the soda ash reactor. The recovered minerals could be sold as valuable minerals to metallurgical houses and off-set the process/running cost. Reverse Osmosis (RO) was used to further clean the water to meet drinking water quality. A single pass RO system was simulated in Reverse Osmosis System Analysis (ROSA). The produced water meets the requirements of the South African National Standard (SANS) 241 Drinking Water Specifications. As such, it can be concluded that this integrated technology has shown that drinking water and valuable minerals can be recovered from AMD.