

Complete sulphate removal from neutralised acidic mine drainage with barium carbonate

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ABSTRACT

The most widespread method used for the treatment of acidic mine drainage (AMD) is neutralisation through the addition of lime to the effluent in order to raise the pH. As a result, dissolved metals precipitate as metal hydroxides while partial sulphate removal is achieved. However, further treatment is required in order to reduce the sulphate concentration to below 500 mg/l, which is the required concentration for discharge into waterways. The CSIR developed and patented the ABC (alkali-barium-calcium) Desalination process which uses barium salts to further reduce the sulphate concentration to acceptable levels with the added advantage that sulphate removal can be controlled due to the low solubility of BaSO₄. This paper reports on the results of an investigation to demonstrate the performance of this sulphate removal reaction. Laboratory results that draw attention to the conditions required for BaSO₄ precipitation are presented. A number of parameters, including temperature, initial sulphate concentration, barium-to-sulphate molar ratio and different BaCO₃ sources were considered. The results were also tested and verified on industrial process water. The results clearly demonstrate that the reactor temperature, initial sulphate concentration, and molar ratio of barium to sulphate have a positive influence on sulphate removal.