

## **Regeneration of barium carbonate from barium sulphide in a pilot-scale bubbling column reactor and utilization for acid mine drainage**

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### **ABSTRACT**

Batch regeneration of barium carbonate ( $\text{BaCO}_3$ ) from barium sulphide (BaS) slurries by passing  $\text{CO}_2$  gas into a pilot-scale bubbling column reactor under ambient conditions was used to assess the technical feasibility of  $\text{BaCO}_3$  recovery in the Alkali Barium Calcium (ABC) desalination process and its use for sulphate removal from high sulphate Acid Mine Drainage (AMD). The effect of key process parameters, such as BaS slurry concentration and  $\text{CO}_2$  flow rate on the carbonation, as well as the extent of sulphate removal from AMD using the recovered  $\text{BaCO}_3$  were investigated. It was observed that the carbonation reaction rate for  $\text{BaCO}_3$  regeneration in a bubbling column reactor significantly increased with increase in carbon dioxide ( $\text{CO}_2$ ) flow rate whereas the BaS slurry content within the range 5–10% slurry content did not significantly affect the carbonation rate. The  $\text{CO}_2$  flow rate also had an impact on the  $\text{BaCO}_3$  morphology. The  $\text{BaCO}_3$  recovered from the pilot-scale bubbling column reactor demonstrated effective sulphate removal ability during AMD treatment compared with commercial  $\text{BaCO}_3$ .