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 (BaCO3) from barium sulphide (BaS) slurries by passing CO2 gas into a pilot-scale bubbling column reactor under ambient conditions was used to assess the technical feasibility of BaCO3 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 CO2 flow rate on the carbonation, as well as the extent of sulphate removal from AMD using the recovered BaCO3 were investigated. It was observed that the carbonation reaction rate for BaCO3 regeneration in a bubbling column reactor significantly increased with increase in carbon dioxide (CO2) flow rate whereas the BaS slurry content within the range 5–10% slurry content did not significantly affect the carbonation rate. The CO2 flow rate also had an impact on the BaCO3 morphology. The BaCO3 recovered from the pilot-scale bubbling column reactor demonstrated effective sulphate removal ability during AMD treatment compared with commercial BaCO3.