Environmental Technology

Acid mine drainage neutralization in a pilot sequencing batch reactor using limestone from a paper and pulp industry

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Abstract

This study investigated the implications of using two grades of limestone from a paper and pulp industry for neutralization of acid mine drainage (AMD) in a pilot sequencing batch reactor (SBR). In this regard, two grades of calcium carbonate were used to neutralize AMD in a SBR with a hydraulic retention time (including settling) of 100 min and a sludge retention time of 360 min, by simultaneously monitoring the Fe(II) removal kinetics and overall assessment of the AMD after treatment. The Fe(II) kinetics removal and overall AMD treatment were observed to be highly dependent on the limestone grade used, with Fe(II) completely removed to levels lower than 50 mg/L in cycle 1 after 30 min using high quality or pure paper and pulp limestone. On the contrary, the other grade limestone, namely waste limestone, could only achieve a similar Fe(II) removal efficiency after four cycles. It was also noticed that suspended solids concentration plays a significant role in Fe(II) removal kinetics. In this regard, using pure limestone from the paper and pulp industry will have advantages compared with waste limestone for AMD neutralization. It has significant process impacts for the SBR configuration as it allows one cycle treatment resulting in a significant reduction of the feed stock, with subsequent generation of less sludge during AMD neutralization. However, the use of waste calcium carbonate from the paper and pulp industry as a feed stock during AMD neutralization can achieve significant cost savings as it is cheaper than the pure limestone and can achieve the same removal efficiency after four cycles.