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Efficacy of activated MgO, metakaolinite and their composite on the treatment of real acid mine drainage: A comparative study

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Acid mine drainage is a bio-recalcitrant wastewater matrix that poses notorious effect to terrestrial and aquatic ecosystems including other environmental compartments. This is mainly due to its acidic as well as elevated concentrations of Fe, Al, Mn and SO_4^{2-} . In essence, acid mine drainage requires to be contained and managed or treated before releasing to the receiving environment. This will then improve the integrity of the receiving environment and its capability to foster life. In this study, a comparison of activated MgO, metakaolinite and their composite on the removal of heavy and trace metals from acid mine drainage was evaluated. Advanced modern analytical instruments were used to underpin the results. Specifically, the effects of contact time and different dosages (activated MgO, metakaolinite and their composites) were determined through batch experiments. These experiments were done at 60 mins at a 10g/500mL solid-liquid (S/L) ratios, equilibrated and their capacity to neutralize acidity and reduce levels of inorganic contaminants in metalliferous effluents. The study results revealed that the pH of the solutions increased post contacting the activated MgO, metakaolinite and their composite. The levels of inorganic contaminants in metalliferous effluents were also observed to reduce after applying the activated MgO, metakaolinite and their composite. The treatment efficacy demonstrated the following performances order composite \geq activated MgO \geq metakaolinite. This study further concludes that polishing or complementary technique might need to be coupled to further enhance the performance of the system.

Keywords: Acid mine drainage; activated MgO; composite; metakaolinite; metal removals