Reuse of High-phosphorous Iron ore mineral wastes as an adsorbent of sulfate

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Abstract:

Utilizing of mine wastes as an adsorbent in environmental decontamination is a groundbreaking method to promote environmentally safe in mining activities. By this method not only the environmental risks of mining activities will be decrease but also the other environmental contamination can be eliminate. This study investigates the efficiency of High-phosphorous Iron ore mineral wastes as an adsorbent of sulfate in aqueous solution, as one of the most hazardous environmental pollutants. The reason for choosing iron ore mineral wastes as an adsorbent of sulfate is that these wastes can be a combination of different materials which play a role as an adsorbent for sulfate uptake from solution. High-phosphorous Iron ore mineral waste was characterized using XRD, XRF, FTIR spectroscopy and petrographic

observations of thin sections. The response surface methodology (RSM) based on the central composite design (CCD) method was used to design experiments and optimized the effective parameters in adsorption process such as contact time, initial sulfate concentration and amount of adsorbent. Based on RSM analysis, the amount of sulfate adsorption in optimum condition led to 44.51 mg/g that is considerable for the seemingly worthless iron ore mineral waste. The mechanism of adsorption process was identified by Equilibrium and thermodynamic studies. The equilibrium studies, which was examined using non-linear isotherm models (Langmuir, Freundlich, Temkin, Dubinin–Radushkevich, Khan and Koble–Corrigan) uncovered that sulfate adsorption onto High-phosphorous Iron ore mineral waste was performed favorably as a multilayer adsorption in heterogeneous condition with a physical interaction. Thermodynamic studies indicate that sulfate adsorption process onto High-phosphorous Iron ore mineral waste were exothermic and spontaneous.

Keywords: Reuse of iron waste, sulfate decontamination, Optimum condition, Isotherm, Thermodynamic.