

Coagulation-Flocculation Process for Turbidity Removal Using Alum Sludge from Water Treatment Plant

Abstract

The aim of this research was to utilize alum sludge, also known as water treatment residual (WTR) from water treatment plant for preparing sludge reagent product (SRP) as coagulant in removing turbidity of kaolin suspension and river water. The WTR was characterized by examine the inorganic component (functional group, and surface morphology using X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscope (SEM) respectively. WTR had an amorphous structure and contained high aluminum metal constituents with 35.4 %, which can be recovered as coagulant. Acidification was conducted to recover these aluminium in WTR by using sulphuric acid and produced SRP. The optimum condition of SRP prepared from WTR was evaluated through parameters such as sludge concentration, normality and dosage of acid. It has been observed that 1 % sludge concentration acidified with 0.08 ml/ml sludge and 2.0 N H₂SO₄ of SRP gave the maximum percentage turbidity removal of 99.46 %. The performance of SRP in coagulation-flocculation process by using a standard jar test was studied based on the effect of pH, kaolin concentration, and SRP dosage. The highest percentage turbidity removal (99.79 %) was obtained at pH 7, kaolin concentration of 800 mg/L, and SRP dosage of 80 mg/L. The SRP performance was also compared to alum coagulant. The percentage turbidity removal of river water for both coagulants were almost similar, with 90.60 % for SRP and 91.18 % for alum respectively. Thus, SRP has the potential to replace commercial coagulant in water treatment plant in terms of costing and sustainability.