

An Investigation of Sulfide Ion Sorption on Powdered Guava Seeds

ABSTRACT: Sulfide ions present in aqueous environments are also extremely dangerous to the environment and health, and require the establishment of economic and sustainable removal methods. This work conducted a research on the use of guava seed powder, which is an agricultural by-product, as a novel bio-adsorbent in the removal of sulfide ions using batch adsorption. Raw guava seeds were used to prepare adsorbent and it was additionally treated with acid to make it active on the surface and the availability of functional groups. The Fourier Transform Infrared (FTIR) spectroscopy was done to provide comprehensive characterization of the samples in terms of hydroxyl, carboxyl, and C-O functional groups, which were essential to the binding of sulfide ions. Experiments were systematically run to investigate the influence of such parameters of the operational system as adsorbent dose, contact time, temperature and acid activation. The findings showed that adsorption efficiency was rising with the dose and stabilized at 50 minutes of contact time. The temperature change demonstrated that moderate temperature (40°C) maximized the sulfide removal whereas very low or high temperatures decreased efficiency. Guava seed powder that was treated with acids had better removal properties than raw adsorbent as it showed a better removal rate as the powder was more porous and had a higher surface chemistry. According to kinetic analysis the adsorption was pseudo-second order indicating that the rate limiting stage was chemisorption, but the data gave a good fit to the Langmuir isotherm, which confirmed the presence of monolayer adsorption on a homogeneous surface. The current paper identifies guava seed powder as one of the most effective, inexpensive, and environmentally friendly adsorbents to remove sulfide ions in the aqueous medium. The findings indicate that it can be used in the treatment of a wastewater system as a long term and sustainable method of large scale and industrial wastewater processes to address the problem of sulfide pollution.

KEYWORDS: Psidium guajava; Sorption; Acid treated Adsorbent; Batch experiments; Isotherms.