

Magnetite nanoparticles (MNPs) used as cadmium metal removal from the aqueous solution from mill scales waste sources

ABSTRACT

This research carrying out in producing a high percentage of magnetite nanoparticle (MNP) from the waste of industrial mill scales for Cadmium ions removal. The extraction of the magnetite from mill scales waste involved two steps separation technique process known as the Magnetic Separation Technique (MST) followed by Curie Temperature Separation Technique (CTST). The extraction samples were milled using the high energy ball mill (HEBM) at various milling time of 4, 8, 12, 16, and 20 h. The formation of nanosized singlephase hexagonal spinel has been observed as early in 4 h milling time by using XRD analysis. Prolonged the milling time had derived different characteristics of the MNP. The samples then used as an adsorbent in cadmium removal of the aqueous solution. The highest adsorption capacity, q_e was contributed by MNP with an 8 h milling time. This is due to the surface area and the porosity of the samples based on BET reports and HR TEM images. Newly extracted MNP from waste mill scales is cost effective and eco-friendly process that potential in wastewater treatment.

Keyword: Adsorbent; Adsorption; Cadmium (Cd); Heavy metals; Magnetite (Fe_3O_4) nanoparticles; Waste mill scale; Wastewater treatment