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Synthesis of magnetite from raw mill scale and its application for arsenate adsorption from contaminated water

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Abstract

The magnetite particles were chemically synthesized from the waste of hot rolling steel industry. The characterization of the synthesized magnetite was done by using Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM), Energy Dispersive X-ray spectroscopy (EDS) and X-ray diffraction (XRD). The synthesized magnetite particles were used for the adsorptive removal of arsenate from the contaminated water. The maximum adsorption capacity of 7.69 mg was found on the surface of 1 g of the magnetite. The point of zero charge for magnetite is determined at the pH 6. The adsorption capacity of magnetite particles was successfully restored with alkali cleaning. Newly synthesized particles were found to be effective for arsenate removal up to 5 times with regeneration. The synthesis of magnetite from raw mill scale and its application for arsenate adsorption is a cost effective and ecofriendly process.

Keywords

Arsenic; Adsorption; Kinetics; Magnetite; Water treatment;

Highlights

- The raw mill scale was used to synthesize magnetite particles.
- Synthesized magnetite particles were utilized for arsenate removal from contaminated water.
- 1 g magnetite can adsorb maximum 7.69 mg of arsenate.

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