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Evaluation of soils for attenuation and retention of Zn(II) ions from aqueous solution

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ABSTRACT

To decrease environmental hazards of mining activities, it is significant to find eco-friendly and efficient methods of using contaminated soils. One way to reduce environmental risks of mining is to use contaminated soil as an adsorbent in environmental decontamination. This study describes the efficiency of contaminated soil as efficient adsorbent for attenuation of Zn(II) ions from aqueous solution. Soil phases play a significant role in controlling heavy metal mobility in soils. Therefore, the understanding of sorption mechanisms in soil is essential in resolving pollution problems. The ability of two different contaminated soil samples from Sarcheshmeh copper mine to retain Zn(II) ions was evaluated. The objectives of this study were to: (1) investigate isotherm and kinetic models and the dominant sorption mechanism; (2) determine Zn retention in contaminated soil; (3) evaluate the influence of various contaminated soil fractions on Zn sorption by batch method and bioavailability of Zn(II) ions and (4) use scanning electron microscopy and fourier transform infrared spectroscopy to monitor sorption process. The results indicated that chemical process and ion exchange were dominant in sorption process. Retention of Zn(II) ions in contaminated soil decreases with reduction of pH during the time. Moreover, carbonate fraction had significant role in Zn attenuation in contaminated soil. Dispersion of Zn(II) on surface of contaminated soil particles increases after sorption in comparison with that for before sorption.

Keywords: Soil; Sorption mechanism; Retention; Bioavailability; Zn(II) ions

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