A comparative study on the removal of lead from industrial wastewater by adsorption onto raw and modified Iranian Bentonite (from Isfahan area)

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ABSTRACT
In recent years, Bentonite has attracted a lot of interest due to its potential applications and capability for removing heavy metals from aqueous solutions. This ability related to the high ionic exchange capacity and specific surface area. In this study, Iranian Bentonite obtained from Isfahan area was characterized by using X-ray diffraction, X-ray fluorescence, and IR spectroscopy. The effects of different parameters have been investigated on the adsorption of lead from aqueous solution such as contact time, metal concentrations, pH of solution, stirring speed, particle size, amount of Bentonite, and solid in comparison with liquid solution. Bentonite has been modified by NaCl and NH4Cl. As the equilibrium study and the Langmuir, Freundlich, Temkin, and Dubinin–Radushkevich (D–R) models have been used and examined. The correlation coefficients (r²) of lead adsorption have been increased by modification of Bentonite for all models. In addition, the Langmuir model is the best one with correlation coefficient (r²) more than 0.995 for description/adsorption process of lead, which is applied on raw Bentonite and modified Bentonite. The correspondence of Langmuir model for maximum adsorption capacity of raw Bentonite, NaCl–Bentonite, and NH4Cl–Bentonite is 79.3, 102.0, and 94.3 mg/g, respectively.

Keywords: Bentonite; Lead; Adsorption; Modification; Adsorption isotherms