The Removal of Lead Ions from Aqueous Solution by Modified Alumina Nanostructure

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Contamination of water by toxic heavy metals through the discharge of industrial wastewater is a world wide environmental problem. Heavy metals get distinguished from other toxic pollutants, due to their non-biodegradability and can accumulate in living tissues, thus becoming concentrated throughout the food chain and can be readily absorbed into the human body. Even a very small amount can cause severe physiological or neurological damage to the human body [1]. A large number of methods (conventional ion exchange, adsorption, electrolytic or liquid extraction, electro dialysis, chemical precipitation, membrane filtration) have been developed for decontamination of industrial waters [2–8]. They are in this case either economically unfavorable or technically complicated and are thus used only in special cases. Each of these methods has some limitations in practice. Lead as a pollutant is a major concern as it has been used as one of the raw materials for battery manufacturing, printing, pigments, fuels, photographic materials and explosive manufacturing [9]. The presence of lead in drinking water even at low concentration may cause diseases such as anemia, encephalopathy, hepatitis and nephritic syndrome [10]. In this study, the feasibility of modified alumina nanostructure was investigated for the treatment of the aqueous samples. From the research results in this paper, it can be concluded that the modified alumina nanostructure adsorbent exhibits itself a high capability to adsorb Pb ions from aqueous solutions. The adsorption in these systems is highly dependent on pH, contact time, adsorb dose. From the study on adsorption of lead ions metals in batch method, the following conclusions have been arrived at:

i. The kinetic studies indicated that equilibrium in the adsorption of Pb (II) on the modified alumina nanostructure was reached in 80 minutes of contact between the adsorbent and the aqueous solution.

ii. The optimum pH corresponding to the maximum adsorption was found to lie between 4.0 and 5.0.

iii. From the batch studies, it is observed that the increase in the metal uptake capacity with the increase of adsorbent dose.

Results show that modified alumina nanostructure hold great potential to remove lead ions from aqueous and industrial wastewater samples.

References


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