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Removal of Pb(II) ions from aqueous solution using aminated magnetic graphene oxide nanoparticles

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With the development of industry, heavy metal pollution has become a severe environment issue [1].Hence, they are needed to remove from the environmental and biological samples. Lead ion is very harmful to most organisms due to its toxicity and carcinogenicity [2]. Therefore, it is important and necessary to separate lead ions from aqueous solutions. Adsorption is a simple, economically and fast method for removing heavy metals from various wastewaters. In recent years, graphene oxide (GO) has been used as an excellent adsorbent material due to its unique properties [3]. GO has very high surface area and a large number of carboxyl, carbonyl, hydroxyl and epoxy groups, which can be used as anchoring sites for metal ions. However, GO is difficult to separate from aqueous solution due to its hydrophilic nature in the adsorption process. The dispersion of magnetic nanomaterial on GO sheets is very important because it combines easy phase separation and advantages of high adsorption rate [4]. Ethylenediamine (EDA) is low cost, low toxicity and contains two amino groups that can form stable chelates with metal ions. Therefore, grafting ethylenediamine to GO-based materials may increase their adsorption ability. In this study, we attempted to prepare a kind of GO based composite named EDA-GO@Fe_3O_4 (EDA-MGO) with high sorption capacity in comparison with the similar adsorbents, which can be used in wastewater treatment. The aims of this research are to: (1) synthesize and characterize magnetic adsorbent (EDA-MGO) and apply it for removing Pb(II) ions from aqueous media; (2) evaluate the effects of operational parameters on Pb(II) removal such as effect of pH, time, sorbent dose, and temperature; (3) apply kinetics and isotherm models for modelling the adsorption experiments. The results demonstrated that EDA-MGO is a rapid, regenerable and more sustainable sorbent for Pb(II) and thus a promising material for metal ion decontamination. The synthesized nanomaterial and its lead chelates were characterized by FT-IR, gravimetry, UV-Vis spectroscopy, scanning electronic microscopy (SEM) and atomic absorption spectroscopy (AAS) techniques.

References

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