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CHEMICAL PHYSICS OF POLYMER MATERIALS

A Green Ultrasound-Assisted Synthesis of a New Poly (Thiourea–Amide) and its Application in the Removal of Pb(II) Ions from an Aqueous Solution

W. A. Radhi[a, b], T. E. Jasim[a], and A. M. Jassem[a, *]

[a] *Department of Chemistry, College of Education for Pure Sciences, University of Basrah, Basrah, 61001 Iraq*

[b] *Department of Chemistry, Polymer Research Center, University of Basrah, Basrah, 61001 Iraq*

*****e-mail: ahmed.majedd@uobasrah.edu.iq*

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Abstract—In this work, a facial ultrasound technique was employed to synthesize of poly(*N1*-ethanethioyl-*N3*-((6-(methylamino)pyridin-2-yl) carbamothioyl)isophthalamide) as a new polymer from a condensation reaction of 2,6-diaminopyridine and isophthaloyl diisothiocyanate. Different techniques were utilized to prove the chemical structure of the synthesized polymer, including Fourier transform infrared spectroscopy, proton nuclear magnetic resonance spectroscopy, thermal gravimetric analysis, Brunauer–Emmett–Teller, and field emission scanning electron microscopy. The capability of the synthesized polymer to adsorb Pb(II) ions from an aqueous solution was analytically evaluated. The change of several parameters including temperature, pH, contact time, and Pb(II) ions concentration on adsorption process into target polymer was extensively investigated. The results indicated that the optimal adsorption pH was about 6 with the removal efficiency of 84.954% and the adsorbed amount of Pb(II) ions increased with raising temperature. The adsorption isotherms analysis revealed that the Langmuir model was the most relevant to describe the adsorption process compared with the Freundlich model. The study of adsorption kinetics showed that the adsorption model of Pb(II) ions on the surface of target polymer being significantly correlated with pseudo-second-order model. Based on the thermodynamic studies, the calculated enthalpy was endothermic, free energy was negative, and entropy was positive, verifying that the adsorption process is spontaneous.

Keywords: poly(thiourea-amide), ultrasound technique, adsorption application, Pb(II) ions

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