Use of Phosphorus-Containing Polymers for the Removal of Metal Ions from Wastewater

By: Lupa, L (Lupa, Lavinia)[1]; Popa, A (Popa, Adriana)[2]; Ilia, G (Ilia, Gheorghe)[2]

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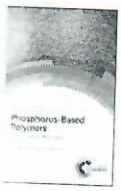

From the book:
Phosphorus-Based Polymers: From Synthesis to Applications

CHAPTER 11

Use of Phosphorus-Containing Polymers for the Removal of Metal Ions from Wastewater

Lavinia Lupa, Adriana Popa and Gheorghe Ilia

The removal of heavy metals from various industrial waste effluents before discharging the effluent is a global environmental concern. In this chapter the advantages of the use of natural and synthetic chelating resins in the removal of various metal ions from aqueous solutions are presented. The chelating resins were obtained by the chemical modification of their surface with different phosphorus pendant groups. One may notice that the modification of the polymeric matrix through phosphorylation of its surface with different phosphorus pendant groups leads to an increase in the adsorption efficiency of the polymer in the removal of metal ions from various aqueous solutions. It was observed that the selectivity for various metal ions and the maximum adsorption capacity of the functionalized polymer depended on the type of the functionalized groups grafted on the polymeric matrix, the properties of the ion-exchange/coordination resin, and the phosphorylation conditions. In conclusion, the use of a functionalized polymer with various types of phosphorus pendant groups showed good feasibility in the removal of metal ions from different aqueous solutions.

This chapter contains 27 page(s)

Chapter 22

Use of Ionic Liquids in Solid-Liquid Separation Processes

Lavinia Lupa , Petru Negrea and Adriana Popa

Additional information is available at the end of the chapter

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Abstract

This chapter reports the possible use of ionic liquids (ILs) in solid-liquid separation processes by their immobilization in suitable solid supports. This method presents some benefits such as economical one—due to the fact that a smaller quantity of ILs is used and the loss of ILs in the aqueous phase is avoided; and second the efficiency benefit—because the advantages of the ILs are combined with the properties of the solid support, and this enhances the removal process of metal ions from aqueous solutions and could be successfully used in the removal processes of metal ions from aqueous solutions containing trace amounts. The type of solid supports used for the immobilization of different ILs, and the methods used for the immobilization were discussed. Also the adsorption efficiency of these ionic liquid immobilized solid supports in the removal process of different metal ions (Cr, Hg, Pt, Au, Pd, Cs, Sr, Tl, etc.) from aqueous solutions were presented. The inorganic materials present a higher efficiency to be used as solid supports for the immobilization of the ILs. It was observed that the physical method of impregnation, especially ultrasonication, has a positive effect on the adsorption capacities of the materials obtained.

Keywords: ionic liquids, heavy metals, impregnation, encapsulation, adsorption

1. Introduction

The huge quantities of waste, discharged from various industries and from human activities, and their negative effect on human health and the environment, have led to some stringent regulations. These have driven researchers to find and develop some new efficient methods for the removal and recovery of organic and mineral contaminants from discharged wastes.

Many separation techniques have been proposed especially for the treatment of wastewaters containing heavy metals, such as precipitation [1, 2] ion-exchange [3, 4] liquid-liquid

Use of Ionic Liquids in Solid-Liquid Separation Processes

By: Lupa, L (Lupa, Lavinia)[1]; Negrea, P (Negrea, Petru)[1]; Popa, A (Popa, Adriana)[2]

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Abstract

This chapter reports the possible use of ionic liquids (ILs) in solid-liquid separation processes by their immobilization in suitable solid supports. This method presents some benefits such as economical one-due to the fact that a smaller quantity of ILs is used and the loss of ILs in the aqueous phase is avoided; and second the efficiency benefit-because the advantages of the ILs are combined with the properties of the solid support, and this enhances the removal process of metal ions from aqueous solutions and could be successfully used in the removal processes of metal ions from aqueous solutions containing trace amounts. The type of solid supports used for the immobilization of different ILs, and the methods used for the immobilization were discussed. Also the adsorption efficiency of these ionic liquid immobilized solid supports in the removal process of different metal ions (Cr, Hg, Pt, Au, Pd, Cs, Sr, Tl, etc.) from aqueous solutions were presented. The inorganic materials present a higher efficiency to be used as solid supports for the immobilization of the ILs. It was observed that the physical method of impregnation, especially ultrasonication, has a positive effect on the adsorption capacities of the materials obtained.

Keywords

Author Keywords: ionic liquids; heavy metals; impregnation; encapsulation; adsorption
KeyWords Plus: CYPHOS-IL-101 TETRADECYL(TRIHEXYL)PHOSPHONIUM CHLORIDE; PHASE EXTRACTION; CYPHOS IL-101; BIOPOLYMER CAPSULES; AQUEOUS-SOLUTIONS; METAL-IONS; FUNCTIONALIZED SILICA; WATER SAMPLES; HCL SOLUTIONS; REMOVAL

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STUDII PRIVIND ELIMINAREA Sr^{2+} DIN SOLUŢII APOASE PRIN ADSORBŢIE PE POLIMER IMPREGNAT CU LICHID IONIC

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Serie:	A
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Sectiune	Disciplina	Predare	Relatia cu studentii	Examinare	Disciplina	Predare	Relatia cu studentii	Examinare
Punctaj obtinut	30.79	26.79	35.79	37.5	30.79	36.67	42.67	43.75
Punctaj maxim	50	50	50	50	50	50	50	50
Procentaj	61.57%	53.57%	71.57%	75%	61.57%	73.33%	85.33%	87.5%
Punctaj total titular	130.86 (din 200)							
Punctaj total asistent	153.87 (din 200)							
Punctaj total materie	140.06 (din 200)							