



Review on Environmental application of aminothiophenol which enhance the removal of mercury and Arsenic.

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Abstract:

Arsenic (As) and Mercury (Hg) are non biodegradable heavy metals which can be released into aquatic ecosystem. These get accumulated in the food chain, and cause a serious threat to the aquatic organism and human health. An important polymer exhibiting a high sensitivity for Mercury (II) in aqueous solution. In this study, the effect of poly-2-amino-thiophenol on the removal of mercury and arsenic ions from aqueous media was examined. The polymer was characterized by Fourier transform infrared spectroscopy UV – vis spectroscopy, X-ray diffraction analysis and scanning electron microscope .The study shows that polymer has potential intern of reusability and high stability.

Introduction

Enormous growth of various industries and increase in the release of pollutants into water resources and environment. This is caused mainly due to heavy metal ions and have cause serious and adverse environmental effects,(1)(2) These metal ions are durable and stable as they do not get destroyed and does not decompose. In recent year, there has been an increase interest in the metal complexation behavior of polymer – supported ligand as analytical reagent, catalysts and in pollution control. Chelating resins and water soluble chelating polymer has been used for the selective removal and recovery of heavy metal ions form drinking water and industrial waste. Previously precipitation, ion exchange, liquid-liquid, extraction and other methods have been used. As many of these metals are essential for life, but when their levels exceed the limit, they cause their accumulation in the food chain and pose many dangers, most probably to human health [5], [6].

Sources of arsenic and mercury pollution are geogenic. Recent studies show that igneous rocks and volcanoes are the most important natural sources of mercury and arsenic. Besides these batteries, pesticides, fertilizers, , mining activities, and the extraction of precious metals can cause surface and groundwater pollution [8], [9]. According to the World Health Organization (WHO), the minimum permissible levels of mercury and arsenic are 0.001 and 0.01 mg/L mg in drinking water [10]. Excess amounts of these metals from the permissible limit, with a specific effect on the mental and nervous, cardiovascular, immune and reproductive systems, causing disease, There are various methods for removing mercury and arsenic ions from aqueous media, including biological [13], chemical precipitation [14], electrochemical [15], and surface adsorption [16]. Each of these methods has advantages and disadvantages. But the adsorption processes which is the simplest, fastest, most effective and most economical option for heavy metal ions removal and therefore have attracted the attention of many researchers [20]. Various adsorbents have been used to adsorb arsenic and mercury in aqueous solutions; which can be mentioned to hematite [21], acrylic polymers

[22], modified-active alumina [23], iron-manganese [24], aluminum Nano crystals – magnetite [25], chitosan [26], iron-modified activated carbon [27], zero-valent iron [28], and modified zeolite with zero-valent iron [29].

The main factors in selecting an adsorbent are low cost and it should be eco-friendly [30], so as adsorbents based on biochar has been used. Biochar is obtained from the pyrolysis of agricultural and animal residues in a low oxygen-containing media or without oxygen [31], [32]. The use of biochar, in addition to being economical efficiently, and environmentally friendly, Biochar is a charcoal-like substance that's made by burning organic material from agricultural and forestry wastes (also called biomass) in a controlled process called pyrolysis.

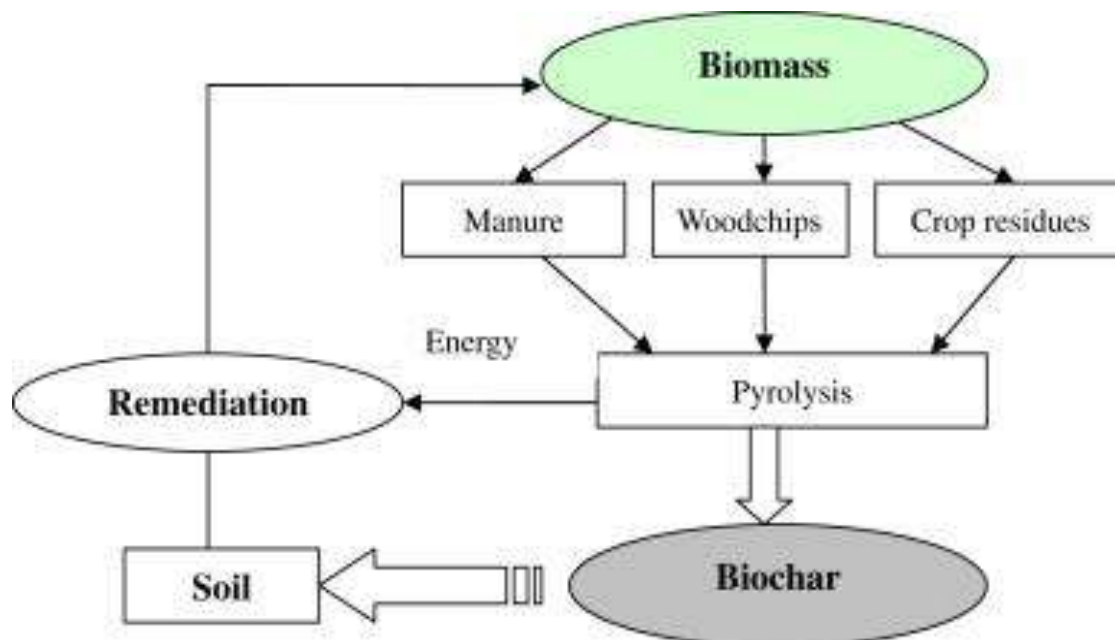
In this article, a new polymeric adsorbent with the immobilization of poly 2-aminothiophenol on biochar derived from date leaves was synthesized and used in the adsorption of Hg(II) and As(III) ions. The immobilization of poly 2aminothiophenol with repeating bifunctional units (NH, SH) leads to an increase in the performance of engineered biochar compared to raw biochar. In the following, the results of using engineered-biochar with poly-2-amino thiophenol to remove arsenic and mercury ions are reported.

Biochar can be produced with raw materials such as grass, cow manure, wood chips, rice husk, wheat straw, cassava rhizome, and other agricultural residues [22, 23].

Material and methods

Required chemicals, including 2-amino thiophenol, ammonium persulfate, mercury nitrate, arsenic trioxide, hydrochloric acid, and sodium hydroxide were purchased from Sigma-Aldrich and used without purification. To make the solutions, double distilled water was used with electrical conductivity of 0.2 $\mu\text{S}/\text{cm}$. The biochar produce from wood chips were used. The prepared biochar-poly 2-aminothiophenol adsorbent was characterized by Fourier transform infrared (FT-IR) Bruker,

The aim of this research was to fabricate a functional adsorbent based on biochar that has a high ability to remove mercury andarsenic. For this purpose the biochar derived from the wood chips that has only physical adsorption with weak interactions absorbs metals by a combination process including cation exchange and metal chelation with carboxyl functional groups.



Conclusions

Biochar as an adsorbent has a high potential in removing metal ions contamination. This adsorbent has received much attention due to its special properties such as low cost, excellent adsorption performance, environmental compatibility, and bio-compatibility in the field of water and wastewater treatment. To increase biochar performance, they can be modified by various methods. Engineered biochar adsorbents have a wide range of properties including easy recovery, no secondary contamination,

References

1. J. Yue, A. J. Epstein, J. Am. Chem. Soc., **1990**, 7, 2801.
2. J. Yue, A. J. Epstein, A. G. Mac Diarmid, J. Mol. Cryst. Liq. Cryst., **1990**, 189, 261.
3. J. Yue, Z. H. Wang, K. R. Cromack, A. J. Epstein, A. G. Mac Diarmid, J. Am. Chem. Soc., **1991**, 113, 2671.
4. J. Yue, A. J. Epstein, Z. Zhong, P. K. Gallagher, A. G. Mac diarmid, Synth. Met., **1991**, 41, 768.
5. J. Yue, A. J. Epstein, J. Chem. Soc., Chem. Commun., **1992**, 21, 1542.
6. J. Stejskal, M. Trchova, J. Prokes, I. Sapurina, J. Chem. Mater., **2001**, 13, 4086.
7. A. Malinauskas, Polymer., **2001**, 42, 3972.

8. D. Goncalves, R. C. Faria, M. Yonashiro, L. O. S. Bulhoes, J. Electroanal. Chem., **2000**, 487, 99.
9. J. M. Ortega, Thin Solid Films, **2000**, 371, 35.
10. T. Nogami, T. Hishida, M. Yamada, H. Mikawa, Y. Shirota, J. Chem. Soc., **1975**, 48, 3714.
11. V. Balogh, M. F'etizon, M. Golfier, J. Org. Chem., **1971**, 36, 1341.
12. R. G. Srivastava, R. L. Pandeyo, P. S. Venkataramani, Indian J. Chem., **1981**, 20, 995.
13. S. Kunimura, T. Ohsaka, N. Oyama, Macromolecules, **1988**, 21, 900.
14. C. Barbero, J. J. Silber, L. Sereno, J. Electroanal. Chem., **1989**, 263, 352.
15. A. Q. Zhang, C. Q. Cui, Y. Z. Chen, J. Y. Lee, J. Electroanal. Chem., **1994**, 373, 121.
16. R. I. Tucceri, C. Barbero, J. J. Silber, L. Sereno, D. Posadas, Electrochimic. Acta., **1997**, 42, 927.
17. R. M. Torresi, S. I. C. de Torresi, C. Gabrielli, M. Keddani, H. Takenouti, Synth. Met., **1993**, 61, 296.
18. J. Stejskal, M. Trchova, J. Prokes, I. Sapurina, J. Chem. Mater., **2001**, 13, 4086.
19. M. R. E. Inoue Navarro, M. B. Inoue, Synth. Met., **1989**, 30, 199.
20. S. Palaniappan, A. John, C. A. Amarnath, V. J. Rao, J. Mol. Catal. A: Chem., **2004**, 218, 47.
21. H. Parham, B. Zargar, R. Shiralipour, J. Hazard. Mater., **2012**, 205, 94.
22. G. G. Hoffmann, W. Brockner, I. Steinfatt, Inorg. Chem. **2001**, 40, 985.
23. S. P. Yawale, S. V. Pakade, J. Mater. Sci., **1987**, 22, 2367.