ADSORPTION OF METAL IONS ON LIGNIN

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Abstract

The number of investigations were provided on the surface assimilation of ions of metal on lignin. Lignin can be prepared from the iron liquor, the devastation of paper mills. This investigation shows that there are two main acid sites of surface lignin contributed to COOH and phenolic groups. Phenolic type has greater attraction for the ions of metal than COOH type. Sorption methods are frequently adopted for heavy metal elimination from water solutions. The low-cost sorbents were studied for the removal of expensive methods used in the elimination of heavy metals from solutions.

Introduction

Pollution of water is a hazardous complication and generally the bulky metals act as water pollutants which effects the health of many organisms and our surrounding. This learning explore the surface assimilation of the bulky metal ions Pb(II), Cu(II), Cd(II), Zn(II) and Ni(II) on a lignin are cut-off the iron liquor which is an exhausted product of paper industry. The attraction of lignin towards ions of metals have the order: Pb(II) > Cu(II) > Cd(II) > Zn(II) > Ni(II). The second abundant raw material and natural aromatic polymer is lignin. It is the building material of cellulose fibre present in plants. It has a number of applications and one of them is production of activated carbon. Low–cost sorbents derived from natural materials are accessibly present hence known as low-cost sorbents. Metal ion sorption property is hectic for the rating of metal ion doings in natural environment. Various techniques were improved to withdraw exhausted matter from waste water.
Materials and methods

In Yunnan Province, south China from a paper mill lignin was derived as below:

The black liquor which is a reused additional product of the crushed wood, was changed into acid at Ph 2-3 with sulphur dioxide. The rigid andsteroid alcohol were distinguished at 60-80 in celcius temperature when the liquid-sediment dissolutions were shifted to a lignin reactor. Solids possessing 80-82% lignin were dehydrated and named as lignin.

Total amount of carbon, nitrogen, hydrogen and Sulphur present in polymer was calculated by dehydrated burning process in an auto analyzer.

Adsorption kinetics

The kinetic investigations was worked in 500 ml vessel at 20 celcius. 1 gram of lignin was primarily different with 400 ml of a 0.01 M of sodium nitrate electrolyte solution in a measuring flask. The dissolution was violently and magnetically mixed for 2h to dry the lignin.

pH effect on the adsorption

1 gram of lignin was primarily mixed with 400 ml of a 0.01 M of sodium nitrate electrolyte solution and was dried for 2h. The dissolution was mixed and titrated step by step mixing of dilute sodium hydroxide at higher pH. The last Ph was calculated and the dissolution was spinned, extracted and examined for the concentration of metal ions.

Lignin origin, source and chemistry.

Isolation of lignin

During isolation of lignin it is difficult to isolate lignin from plant dry matter (biomass) as there occurs various oxidation and condensation reactions.

There are number of methods and one of them is pulping of alkali in kraft or sulphate and the soda process, it shows two variations. The principle reagent in both the processes is NaOH, and in kraft process the extra component is the sodium sulphide.

Lignin as natural adsorbent

Lignin may be a better adsorbent shown by various studies. The achievement for the taking up of KOH, ammonium hydroxide and iodine in potassium solution lignin which are derived from beach and oak.

Low taking of Cu(II) which is one of the most achieved solute and on different types of lignin its sorption was studied by various philosopher.

Lignin as precursor for chars and activated carbons
Hassler in 1963 studied about old activated carbon adsorbents. Gabaldon et al. (2000) stated that activated carbons can be derived or obtained from coal, coconut shells, lignite wood and peat.

Characteristic studies:

Number of surface functional groups are present in activated carbons and based on activation methods and precursors. It was calculated activated carbons IR spectra and from cotton Hydrolytic lignin determined at various temperatures of carbonization the IR spectra are obtained.

Adsorption studies:

From lignin the activated carbons were obtained (Zou and Han 2001); and for methylene blue they recommended the adsorption capacity up to 604 mg/g.

Low-cost sorbents:

Natural materials are available easily in our environment and are inexpensive termed as Low-cost sorbents which are derived from those natural materials. There are various low-cost sorbents used presently such as lignin, zeolite, clay, activated carbons, fly ash, carbon nanotubes etc.

Zeolite:

Various group of minerals comprising dried aluminiumsilicates of sodium, potassium, calcium and barium is termed as zeolite. Zeolite show higher strength for lead and other bulky metals.

Clay:

Same as zeolites the ability for adsorption of clay has an outcome from silicates powdered structural minerals possessing negative charge. Species of positively charged provides capability of clay to stimulate and carry bulky metal cations. Upper most layer up to 800 meter square per gram provides large adsorption ability (Cadena et al, 1990).

Fly ash:

Fly ash is the exhausted material of thermal power plants possessing ability of adsorption for Cr(II) given by Grover and Narayanaswamy in 1982.

Carbon nanotubes:

Latterly, carbon nanotubes have higher interest because of their unequalled morphologies which have a number of applications. Carbon nanotubes have increased upper most layer of sorption properties and were learned for the remotion of various bulky metal ions from fluid.
Li et al described that carbon nanotubes shows oxidation which display extraordinary stronger sorption ability and capability for Pb(II), Cd(II), and Cr(VI) from aqua.

Conclusions

Greater surface assimilation capabilities refers that lignin have ability as chemosorptive for the elimination of metals from aqueous. Potentiometric titrations and other evidences shows that the surface of lignin consists of two important acidic sites contributed to phenolic type and COOH groups and the phenolic group have greater attraction for ions of metal then COOH type. The outcomes of present study provide significant interpretation of the metal surface assimilation on lignin. Low-cost and powerful materials are easily acquirable and can used in position of activated carbons or ion exchange organic compounds.

References
