"NANOCOMPOSITES USED FOR WASTE WATER TREATMENT"

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ABSTRACT

Energy efficient, low-cost, and green methods for the removal of toxic phenolic compounds and zinc from solution are necessary for waste treatment in industrial applications. Herein we present an interesting approach for the utilization of multiwalled carbon nanotubes (MWCNTs) in the removal of phenolic compounds and zinc from solution. Dried pristine MWCNTs were stably incorporated in a solid porous support of polysulphone[1] (PS) facilitating the handling during both direct mixing process of the nanomaterial and uptake of phenolic compounds and zinc, enabling their safe disposal, avoiding expensive post-treatment processes. The adsorption studies indicated that the materials can efficiently remove phenolic compounds and zinc from water. The incorporation of MWCNTs in polymeric matrices did affect their functionality in phenol and zinc uptake. Moreover, the surface of the material could be regenerated, decreasing treatment cost.The characterization of Multi walled Carbon nanotube (MWCNTs) was performed by scanning electron microscope and Fourier-transformation infrared spectra (FTIR) for functional groups. The effect of different parameters such as adsorbent dosage, pH of adsorbate solution and contact time were studied for removal of Zinc and phenolic compound from solutions onto MWCNTs.

Key Words : *Polysulphone,Mwcnt,Zinc,Phenolic Compounds.*

INTRODUCTION:

Water pollution is a dangerous environmental problem. Petrochemical, pharmaceutical, steel, and agricultural industries produce a huge number of phenol, zinc and phenolic compounds, which are common contaminants in industrial wastes. Zinc and phenolic compound is most hazardous material that is being widely used. These compounds is released into the environment from various industrial activities such as ores and municipal wastewater treatments.The treatment of heavy metals in wastewater and drinking water is utilized the heavy metal levels to be reduce sto the acceptable concentration[2]. Several conventional methods are available to remove heavy metals ions from wastewater. Exposure to phenolic compounds and zinc, even at low concentrations and short-term exposure,leads to high irritation to eyes, skin, and mucous, and causes headache . Long-term exposure results in high blood pressure and severe liver and kidney damage. Various adsorbents, like nanoparticles , activated carbon, resins, and other low-cost adsorbents, have been used for removal of phenolic compounds. Carbon nanotube materials have demonstrated good capacity for adsorption of phenols from aqueous solutions. Their large surface area, porosity, and functional groups are features that can enhance their adsorption efficiency.

MATERIALS USED:

Polymer Material : polysulhpone.

Nanomaterial : Multiwalled carbon nanotube.

Compounds targeted : zinc and phenolic compounds.

SPECIFICATION TABLE OF MWCNTS:

PROPERTIES	**VALUES**
LENGTH	10-20nm
DIAMETER	3-8um
PURITY	>95%
SPECIAL SURFACE AREA	90-350 m^2/g

PREPARATION METHOD OF NANOCOMPOSITE:

Direct Mixing of Polymer and Nanomaterials :

Direct mixing of a polymer matrix and nanofillers is a simplest method of nanocomposite fabrication and it is based on the breakdown the aggregated nanofillers during mixing process. This method is suitable for fabricating polymer matrix nanocomposites and it involves two general ways of mixing the polymer and nanomaterials. One method is mixing a polymer, in the absence of any solvents, with nanoaterials above the glass transition temperature[3] of the polymer, generally known melt compounding method . The other method is mixing of polymer and nanofillers in solution involving solvents, generally called solvent method/solution mixing .

Figure : Direct Mixing Of Nanocomposites

NANOCOMPOSITE CHARACTERISATION AND ANALYSIS METHODS

FTIR :

To obtain infrared spectrum of absorption or emission of a solid, liquid or gas Fourier-transform infrared spectroscopy (FTIR) technique is used.It simultaneously collects high-spectral-resolution data over a wide spectral range[4].

This give a significant advantage over a dispersive spectrometer, which measures intensity over a narrow range of wavelengths at a time.

chemical and electronic structure of individual nanocrystals.To pass through the samples in the very high vacuum chamber the focused beam of electron is allowed. The final data are recorded using a charged couple device.

SEM :

Scanning Electron Microscopy resolution is traditionally associated with the electron beam spot size, which is smaller at higher acceleration voltage. Detailed information of the nanocomposite morphology, conductivity and even the modes of fracture can be obtained at the nanometer scale by combining various SEM techniques.

TEM :

Transmission electron microscopy (TEM) is a powerful and unique technique for characterisaation of the microstructure of the prepared nanocomposites. By forming a nanometer size electron probe, TEM is unique in identifying and qualifying the

REMOVAL OF WASTEWATER COMPONENT BY VARIOUS OPERATING CONDITIONS:

Functionalisation Of Carbon Nanotubes**.**

0.5 g of CNTs will be immersed in 500 ml of mixture of concentrated (HNO3:H2SO4) (1:3 by volume) at room temperature. The CNTs solution with acid is ultrasonicated using ultrasonic path for 40 min at 40°C. The solution is then diluted 15 times with deionizer water and then filtered using vacuum filtration system with 0.2 μm pore size filter papers[5]. This washing operation is repeated until the pH became the same as that of deionized water. The CNTs on the filter paper is then left to dry at room temperature for 12 hours. After drying a sharp blade is used to remove CNTs from filter paper and then dried in an oven at 60°C for 6 hrs

PROPERTIES OF CNTs.

CNT is the strongest and stiffest material. CNTs have a special capacity of changing their physical properties according to different axes of the matrix. This phenomenon is called ‘anisotropy’. CNTs is highly conductive material.

APPLICATIONS:

Zinc:

-Zinc alloys are widely used in the production of many components and die casting fittings in automobile manufacturing.

-Zinc is also used in galvanization industry.

-Zinc fertilizer can promote plant cell respiration and carbohydrate metabolism.

-Zinc is used as catalyst in many chemical industries.

Phenolic Compound:

-A broad range of phenolic compounds occur in food products, especially those of plant material in which they contribute to the organoleptic properties.

-The phenolic compound called Quinone is used as skin whitener.

-Eugenol is a phenolic compound added in mouthwashes and also has some antiseptic and local anesthetic effect.

EXPECTED OUTCOME:

-Understanding of fundamentals of nanocomposite, waste water, preparation methodology, etc.

-To study the characterization of nanocomposite.

-Removal of highly useful heavy metal and organic compound from waste water.

CONCLUSION:

In a current scenario, there is a significant need for advanced water technologies to ensure a high quality of water, eliminate chemical and biological pollutants. In recent years, polymer nanocomposites have attracted great interest, both in industry and in academia, since they exhibit remarkable improvement in properties. Polymer nanocomposites contain nanofiller materials, which cause ‘ nano-effect’ and drastically improve nanocopmosite properties.

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