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Removal of Polyaromatic Hydrocarbons from Water

Fereshtehbashiri
University Of West Tehran. Iran

ABSTRACT: *Unsaturated cyclic aromatic compounds that are present at high concentrations in the crude oil, are including benzene, toluene and xylene. They can be an important source of water pollution. Benzo pyrene indicate the presence of these compounds in contaminated water into the environment. These compounds into the environment as a result of incomplete combustion of fossil fuels as a source of natural or man-made. These compounds are highly carcinogenic effects that enter the body through the air or food will be available. The use of columns filled with water from organic absorbent material is highly effective in removing the material. The use of nanoparticles for the removal of these contaminants is very appropriate that these coatings use to extract and measure the batch of hydrocarbons and polycyclic aromatic of samples of contaminated water. The Nano-composites can be produced easily and in addition to longevity of good stability as well. Zeolite nanoparticles and carbon nanotubes are from other suitable methods. Carbon nanotubes are a lot of electrons on the surface that can be paired with aromatic pollution. The aromatics as electron acceptor and electron donor sheets of graphene to act as the effective removal of aromatic pollutants play an important role. In this paper the Titania in photocatalytic process use to remove contaminants to harmless by-products and recycling is much better than other known methods.The Cyclodextrin Mesostructured Silica Nanoparticles and magnetic Nano particle are suitable to remove PAHs from water resources too that is very simple to use.*
Hope that using the nanoparticles have a big change in removal of water and sanitation

Keywords: *poly-aromatic hydrocarbons, water pollution, Titania*

I. INTRODUCTION

Rivers, streams, lakes and water underground sourceschange to the waste water due to the factories, homes, high consumption and increasing detergents, cleaners, shampoos, farm fields, and gardens.Chemical fertilizers and pesticides that are used as landfills are becoming increasingly polluted and the water that we drink includes the amount of different pollutants, particularly chemical pollutants.The simple treatment is never capableof the features that deal with a large number of these chemicals and compounds for chemical reactions. In fact unusable waste materials and residues are caused by human nature. Most of substances remain toxic in nature, have effect on human or cause the loss of animals, plants and micro-organisms in the water. One of the hazardous substances that are part of emerging pollutants are aromatic.

Unsaturated cyclic aromatic compounds that are present at high concentrations in the crude oil includes benzene, toluene and xylene. These compounds have an important role in the petrochemical industry and octane number of gasoline. In a hexagonal carbon structure, the hydrogen atoms are attached to it. These dayspolyaromatic hydrocarbons can be an important source of water pollution. Benzo pyrene indicate the presence of these compounds in contaminated water into the environment. These are a result of incomplete fuel and highly carcinogenic. Various methods of treatment are not effective in complete removal of the contaminants and it needs for more complex systems. [1]

These compounds into the environment are as a result of incomplete combustion of fossil fuels of natural or man-made sources. These compounds are highly carcinogenic effects that enter the body through the air or food. [2] PAH Sources

1) Existence of coal in pipes used for protection against corrosion
2)WaterDisinfection
3)Pyrolytic resources as a result of the combined use of oil as fuel
4)Petro genicsources that cause by the consumption of oil derivatives.

5) Settlingpolyaromatic compounds in the atmosphere that are connected to the suspended particles and water resources are entered in the rain.

6) Urban pollution caused by discharges of untreated human and industrial waste and oil terminals [13]Protection of water resources against PAH
1) Protection of water resources in rivers and dams and prevent from pollution of domestic and industrial area.
2) The establishment of an international standard that specifies the allowable amount of these compounds.
3) Complete elimination can controlledby chlorination of purification techniques [3]

Remove PAH by Organic materials

The use of water treatment columns filled with organic absorbent material is highly effective for removing poly-aromatic.With a pump flow rate to regulate the pipes. The removal of pollutants in the exhaust pipe is very good and acceptable. By gas chromatography and spectrometry and ion copper output monitoring emissions can be analyzed. The poly-aromatic hydrocarbons can be reduced to 97.2%. So this value is standard. This amount is suitable to protect marine life and the elimination of cancer.
This method is one of the most important methods of removing polyaromaticthat can be very effective. [4] Removal of PAH by Nanocomposite coating

These coatings is used to extraction and determination of polycyclic aromatic hydrocarbons in water. This Nanocomposites made of multi-walled carbon nanotubes and Ortho-amino phenol on the surface of a wire that made of stainless steel as an electrode to measurement and absorbed of the carcinogens emissions.This Nano-composites is very effective for the isolation frompolyaromatic. [14]Removal of PAH by magnetic nanoparticle adsorbent Disperse magnetic Nano particle with magnetite core andsilica mesoporous layer that permanently confines surfactant micelles within mesoporous can remove polycyclic aromatic hydrocarbons and metal contaminant. [6] Remove PAHs by Cyclodextrin Mesostructured Silica Nanoparticles and pristine mesostructured silica nanoparticles

This is a novel concept for PAH removal from water. The adsorption applications of pristine mesostructured silica nanoparticles are greatly restricted due to the absence of surface functional groups on such particles. In this regard, Cyclodextrins can serve as ideal functional molecules capable of inclusion-complex formation with many hydrophobic molecules, including genotoxic PAHs. The Cyclodextrin Mesostructured Silica Nanoparticles were synthesized by the surfactant-templated, NaOH-catalyzed condensation reactions of Tetraethyl Orthosilicate in the presence of two different types of Cyclodextrin. The Cyclodextrin Mesostructured Silica Nanoparticles were treated with aqueous solutions of five different PAHs. [7]

Removal of PAH by Zeolite Nanoparticles

In this method two types of natural Kolinopetilolitsieve with appropriate size and modified with Surfactant such as HexadecylTrimethylammonium and CetylPyridiniumBromide. Nano zeolites obtained after conversion to a relatively coarse granules of 590 to 840 micro-meters that have become similar to Nano Zeolite membranes. Here you can compare them with micro-size and nano-granular particles and the above surface modification and surfactants used in the absorption of aromatic compounds [15].

RemovalPAH by Carbon Nanotubes
Carbon nanotubes have a lot of electrons on the surface that can be paired with aromatic pollution. The aromatics as electron acceptor and electron donor sheets of graphene play the effective removal of aromatic pollutants. [5]

Removal of PAH by Nano Titania
This is one of the best methods for remove aromatics because of having empty band capacity and potential of electrons for oxidation. Titanium dioxide is a white powder of metal oxides. Two important property include photo-catalytic properties and hydrophilic noted above.
These two characteristics can remove contaminants in water and air very effective. It causes a chemical reaction in the photo catalyst without any change in substance [2].
The benefits of using photocatalytic process with titanium:
- It is harmless to the formation of products.
- Suitable for the destruction of dangerous substances such as aromatics
- Suitable for liquid and gas filtration and partly solid phase
- very low reaction time
- the minimum required chemicals
- at least secondary production
- the possibility of recycling

Using a suitable catalyst in this reaction is very essential. The catalyst should be stable against corrosion and wear non-toxicity of high speed and low cost of not taking appropriate properties. [8] Gram-positive and Gram-negative bacteria are very sensitive to the toxicity for Gram-positive Titania and more. The antimicrobial properties is excellent in water reactors. The concentration of titanium dioxide used in this method is from 100 to 1000 ppm and about 30 minutes per ml placed under the light. Titania can solubilizing agents (such as hydroxyl groups) for suspension or fixing on glass and stainless steel and for plates with artificial light sources used acetate. [9] Titania is also very cheap and non-toxic and long-lasting.Using Titania Titania can be coated as a thin film on a solid areas that are three ways to cover the fixed bed reactors, fluidized bed or there. Impregnation: is a simple technique and requires no sophisticated equipment, but Titania coating is not uniform and easily peeled.Chemical vapor deposition: that is uniform and homogeneous. Sol _gel techniques: choosing the best method is to place the substrate on the activity and uniformity and adhesion affect Titania film.

Water purification using Titania

The Titania particles with micrometer size that are suspended in water and can be restored after treatment. In fixed bed reactors a thin layer of Titania on flat plates that contain polyaromatic waters of the pages will be rejected and the pollutants will absorb. It has a simple design and function of the upper contact with oxygen, it is recommended that suppliers. But the high level requirements and possible restrictions on mass transfer coefficients for laminar flow can be mentioned disadvantages. [10] Other important issues include the role of dissolved oxygen in the removal of aromatics noted that impede or accelerate the reaction. It also should not be forgotten that the process of photocatalytic always prefer acidic conditions. Adsorbents such as silica and zeolite can add some of Titania photocatalysts process to remove contaminants lift.

Synthesis of Titania

Chemical and optical properties of nanoparticles compared to conventional materials. Special power that can be of different methods of synthesis of these particles and the size and amount of crystalline phase to determine them.

- Sol-gel method: the ability to produce Titania nanoparticles with a minimum particle size of about 5 to 6 nm and is spherical.
- Hydrothermal Method: This method can be produced Titania nanoparticles in various shapes and sizes 8 nm.
- Chemical premises and methods: spherical nanoparticles with sizes less than 10 nm can be produced.
- Thermal plasma method: for the synthesis of nanoparticles of inorganic and organic precursors and nanoparticles are spherical with a size of less than 50 nm.
- Chemical vapor condensation process: that spherical nanoparticles with high purity and have an average size of 20 nm.
- Micro-mixing method: a controllable particle size of about 8 nm.

II. METHOD

All photocatalytic reaction in a reactor done in Pyrex. To control the reaction temperature the reactor use inside thermostat and all equipment is enclosed with aluminum box to prevent the entry of additional lighting.Polyaromatic hydro-carbon are toxic substances and to prevent of spread to the system must be equipped with ventilation.

Table Remove PAH

PAH removal	removal
Without UV (35 C)	69%
With UV (40 C)	95%
UV , 5% Tio2 (20 C)	87%
UV , 20% Tio2 (20 C)	72%
UV , 5% Tio2 (40 C)	95%
UV , 20% Tio2 (40 C)	71%

[12]

III. CONCLUSION

Polyaromatic hydro-carbon are important sources of water pollution and in the past try use organic aterial to remove them from the water. Nano particle can have wonderful effect to remove

PAH and be useful for water purification Hope Nanoparticles can help to remove the major pollutants in the best conditions and with the lowest cost from environmental resources.

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