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Treatment Of Heavy Metals And Impurities From Waste Water By Nanoparticals: A Review

Tanuj Sharma[1], Brijesh Chauhan[2]
[1]Lecturer, Ambition Classes Sen. Sec. School,Mohal, Kullu,Himachal Pradesh
[2]Principal,Government P.G. College,Seema,Shimla,Himachal Pradesh

Abstract:

Water is one of the most important factor in the base of human civilization. 70% part of earth is acquired by water out which 97% of water is salt water, 2% water is in frozen state and remaining 1% is not distributed evenly to the whole world[1] .Safe drinking water is considered a most important factor of a country's development and according to recent reports, about 663 million people around the world do not have access to safe drinking water [2]. Safety of drinking water is judged by national standards or international guidelines with WHO guidelines for drinking water quality and it is implemented by many developing countries [3]. Reports shows that over a billion of the estimated 6.2 billion people relying on improved water sources continue to use unsafe water [4].The treatment of drinking water with regard to public water supplies generally consists of a series of barriers in a treatment of water that generally varies according to the requirements of the supply and the availability of the water resources [5].However, groundwater acts a vital role for several naturally occurring and anthropogenic ions such as fluoride,lead, chromium, selenium, chloride, nitrate,arsenic heavy metals and as well as radioactive materials which greatly affect the groundwater quality leading to health problems[6]. Besides inorganic pollutants, industrial waste water also contains organic pollutants which have to be treated before the water can be discharged. Biological treatment is the most economic process and is usually used for treatment of "readily degradable" organic pollutants present in the waste water. The situation is completely different when the waste water contains toxic or and refractory organic pollutants. In this case, another type of treatment must be used. The electrochemical method for the treatment of waste water containing organic pollutants has attracted a great deal of attention recently [7-9].So in the present review various techniques and methods for the sustainability and purification of water by the nanoparticals have been studied.

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Keywords: Magnetic nanoparticals, Purfication methods, Pathogens, Treatmenttechnology, Nanophotocataysts.

Introduction:

India is facing one of its major and most serious water crisis.After two consecutive years of weak monsoons, 330 million people — a quarter of the country's population — are affected by a severe drought. With nearly 50 per cent of India grappling with drought-like conditions, the situation has been particularly grim this year in western and southern states that received below average rainfall.India is among fastest developing countries and industrial revolution in India growing day by day. Therefore consumption and pollution of water due to waste of several industries are also taking hike. India is a country with 2nd highest population in the world therefore consumption of water is high.

Though India is a developing country still there are no effective ways to prevent river water to get polluted and doesn't have enough sources for the treatment of polluted water.

According to the report of the National Institute for The Transformation of India Ayog, 600 million Indians face high to extreme water stress and about 200,000 people die every year due to lack of clean water. There is a huge possibility that till 2020, 21 most developed cities in India will not have groundwater that can affect nearly about 100 million people across the country. India ranked 120 among 122 in the water quality index because 70% of water her is contaminated.

NITI-Ayog Report:

According to a study by the federal government think that as per NITI Aayog, 21 Indian cities will run out of groundwater by next year, including the capital New Delhi and the information technology hub of Bengaluru. Two hundred thousand Indians already die every year because they don't have a safe water supply, the report said. A shocking 600 million people face "high to extreme" water stress.Things might get even testier up north, where more

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than a billion people depend upon rivers that rise in the Himalayas. Bangladesh and Pakistan feel that India is being stingy with river water. Indian strategists constantly worry that China will divert water from the Himalayan rivers that rise in Tibet to feed the thirst cities in its own north.Nanotechnology for water treatment: Nanotechnology deals with very small size(1-100nm) particles of various types of materials. Various studies has been done and many are in process for waste water treatment usingnanoparticles[10-12].Nanoadsorbents,

magnetic nanoparticles, photocatalysts, nanoparticles enhanced filtration are recently developed nanomaterials for treatment of wastewater[13].

Nanomaterials as adsorbents: Adsorption is a process which is limited to the surface only. In adsorption process the molecules of a gaseous liquid or dissolved solid sticks on any surface to form a layer or film of molecules on that surface. Among all the water treatment techniques adsorption is the most commonly used method to remove contaminants from the drinking water due to the factors: cost effectiveness, easy to operate and it does not create secondary pollutants during removal of contaminants from the water. The properties of naoparticles which are responsible for making them absolute adsorbents are that, large specific surface of the nanoparticles and multifunctionality of surface [14] [15] As such properties make nanoparticles to easily react chemically and to bind with the adjacent molecules. nanotubes. Carbon nanotubes are divided in two types based on the number of outer layers present and purification of singe walled carbon nanotubes is very difficult while multiwalled carbon nanotubes can be easily synthesized with good purity[16].The nanomaterials have specific properties(chemical, optical, magnetic, dielectric, mechanical, electrical etc.) than their bulk properties. That is why the nanoparticles are now widely used in number of applications.

Mahadavi and co- authers fabricated Amino-functionalized Fe_3O_4/SiO_2 Magnetic Nano-adsorbent by chemical coprecipitation method to remobe lead contaminants from aqueous solution(17) C18-functionalised Fe_3O_4/SiO_2 microspheres can be used as magnetic sorbents to remove and refine organophosphorus pesticides from water by using magnetic solid phase extractionas with their important qualities like good solubility , fast separation capability and large surface area(18).

Magneticnanoparticles, Nanocomosites ,Nanoadsorbants and Pathogens : Water pollution is increasing drastically day by day & to deal with this severe problem a lot of studies has been done during past several years.

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Adsorption has been considered as the best method to remove heavy metals from polluted water. While magnetic nanoadsorbents are being preferred over other classical adsorbents due to their high surface area and easy as well as fast separation capacity. Magnetic nanoparticles, nanoadsorbents and nanocomposites are made up of magnetic cores and inorganic & organic shells which provides high magnetic response and appropriate functional groups and also protects from acc Also pathogens plays a tremendous role in purification of water. Some of nanomaterials for the removal of pollutants are shown as:

Sr.No	Type of Absorbant	Type of Pollutant	Dose	Contact time	Refrences
1	Metal substituted cobalt ferrites	S.Aureus,P. Aeuroginosa	(16.0 ml)/15ml	3hrs	(19)
2	Nd^{3+} doped TiO_2 coated $NiFe_2O_4$	Bacteria	TiCl4 (0.08 ml)	40 Minutes	(20)
3	Sliver Nanoparticals	Bacteria	15ml	2Hrs	(21)
4	Fe_30_4 Nanoparticals	Bacteria	20ml	1Hrs	(22)
5	Cadmium Substituted Ni Ferrites	Removal of Bacterial Strains	30ml,60ml	24 hrs	(23)

Conclusion: From the above research it is concluded that in the present scenario more authentic work should be done on the purification of ground water in the ground level so that people can drink safe water in each and every sphere of world.

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