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Activated polymer adsorption for water treatment replacing activated carbons

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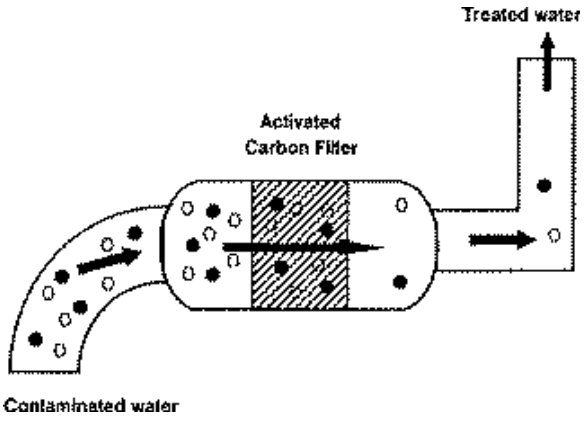
Abstract
Idea involves the hypothetical analysis study of the newly stated method for water treatment using activated polymers. The research involves use of the dielectric property and strong structural geometry of single polymer chains which can be activated using high charge density voltage exposure. The polymer size used is typically 10000 times larger than that of the impurities in water and million fold larger than that of the water. By activating the adsorbing sites on the surface of the polymer by charging them with high voltage using ultra capacitors can lead us to a revolutionary step in water treatment. The process of post filtration is also adopted to filter out the used polymer chains/clumps.

Keywords: Polymer, Activated Carbon, Ultra capacitors, Water Treatment, Water Filtration, Membrane Filtration.

1. Introduction
This involves the background study of currently adopted water treatment methodology, one of which is Activated Carbon. In which some are activated carbon surface adsorption methodology, which is expensive and difficult to implement.



Carbon filtering is a method that uses a bed of activated carbon to remove contaminants and impurities, using chemical absorption. Each particle/granule of carbon provides a large surface area/pore structure, allowing contaminants the maximum possible exposure to the active sites within the filter media. One pound (450 g) of activated carbon contains a surface area of approximately 100 acres (40 Hectares). Active charcoal carbon filters are most effective at removing chlorine, sediment, volatile organic compounds (VOCs), taste and odor from water. They are not effective in removing minerals, salts, and dissolved inorganic compounds.
Typical particle sizes that can be removed by carbon filters range from 0.5 to 50 micrometers. The particle size will be used as part of the filter description. The efficacy of a carbon filter is also based upon the flow rate regulation. When the water is allowed to flow through the filter at a slower rate, the contaminants are exposed to the filter media for a longer amount of time.

Limitations: Water streams with high solids, oil and grease can cause fouling of the activated carbon. Another limitation is that the activated carbon does become spent over time and new carbon must be put in its place. The spent carbon must then be disposed of in an appropriate manner. The up side is that the activated carbon may be reactivated or discharged. In most cases the spent carbon is not hazardous; however, if you are unsure about your carbon being non-hazardous or hazardous, it is always best to have it tested.

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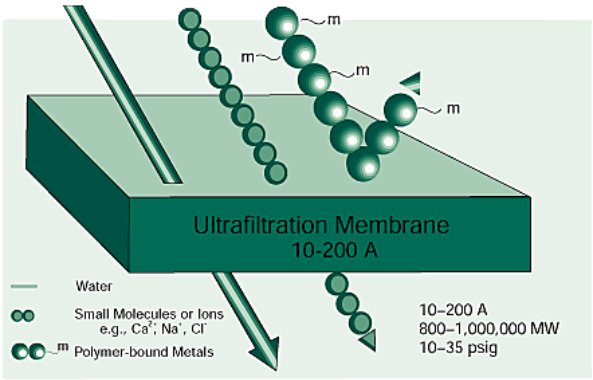
2. Polymer Filtration Mechanism

Currently adopted polymer filtration methods uses specialized pore mechanized & structurally distinct polymer matrix that bind metal ions to theirs pores surface and allow clean water to pass through it. This method is expensive and highly selective. It is only applicable for the metallic ion impurities. Polymer Filtration uses chemically modified water-soluble polymers to remove valuable or regulated metal ions from aqueous waste streams. The special polymers selectively bind metal ions, creating larger compounds that can then be filtered from the waste stream. While the technology has been successful in several demonstrations, such as capturing nickel and zinc for reuse from electroplating solutions, removing americium and plutonium from wastewaters, and removing mercury from debris for disposal, Polymer Filtration is in only the early stages of commercialization.



Polymer Filtration is a membrane-based technology for metal-ion recovery. This separations technology uses specially designed, water soluble polymers that selectively bind metal ions to prevent metals from entering waste water streams and to prevent sludge formation.

The proposed idea tend to modify this approach of water filtration and water treatment.

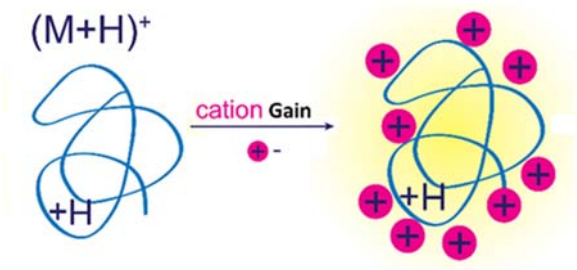
3. Dielectric Polymer Chains

Polymers are generally dielectric in nature and do not respond to any polar solvent. However they have a capacity to hold a charge onto their surface and onto some specific sites. The potential polymer chain material which can be used for activated polymer filtration are listed below.

Polymer	Dielectric Constant (low frequency, 50 Hz)
Polystyrene	2.5
Poly(1-vinyl naphthalene)	2.6
Poly(1-methyl styrene)	2.6
Poly(o-chlorostyrene)	2.6
Poly(vinyl chloride)	2.8
Poly(methyl methacrylate)	2.6
Poly(ethyl methacrylate)	2.7
Poly(2,6-dimethylphenylene oxide)	2.6
Poly(bisphenol carbonate)	2.6
Poly(cis-butadiene)	2.0
Poly(cyclohexyl methacrylate)	2.5
Parylene	2.6

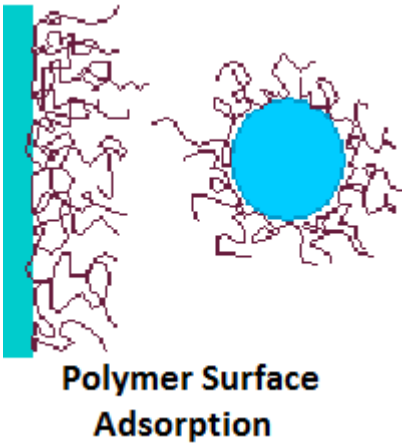
The above polymers are non-soluble in water and can easily be filtered out by selectively permeable membrane.

4. Polymer Activation Mechanism



Above diagram shows the activation of the polymer surface by gaining the cation and activation of the specific sites. M shows the polymer matrix and H+ shows its tendencies to accept or gain cation. This charging process is done in the an non-polar solvent to accumulate a homogeneous activation on the solute i.e. the polymer chain surface.

5 Polymer Surface Adsorption



Above figure shows the surface adsorption of impurities on the activated sites of the polymer chain matrix. The figure shows the transition of the long polymer chain to form a clumps of spherical shape that could be a replacement of activated carbon.

6 Post Membrane Filtration

The following representation shows the cross flowing membrane filtration process that completes the pre filtration and charging polymer process.

The clumps are separated and disposed off for recycling and it is economical due to low cost of polymer.

7 Acknowledgment

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8 References

1. Osada Y, Nakagawa T. Membrane Science and Technology, New York: Marcel Dekker, Inc, 1992.
2. Zeman Leos J, Zydney Andrew L. Microfiltration and Ultrafitration, Principles and Applications. New York: Marcel Dekker, Inc, 1996.
3. Mulder M. Basic Principles of Membrane Technology, Kluwer Academic Publishers, Netherlands, 1996.
4. Jornitz Maik W. Sterile Filtration, Springer, Germany, 2006.
5. Van Reis R, Zydney A. Bioprocess membrane technology. J Mem Sci. 2007; 297:16-50.
6. Templin T, Johnston D, Singh V, Tumbleson ME, Belyea RL, Rausch KD. Membrane separation of solids from corn processing streams. Biores Tech. 2006; 97:1536-1545.
7. Ripperger S, Schulz G. Microporous membranes in biotechnical applications. Bioprocess Eng. 1986; 1:43-49.
8. Thomas Melin, Robert Rautenbach. *Membranverfahren*, Springer, Germany, 2007, ISBN 3-540-00071-2.
9. Munir Cheryan. Handbuch Ultrafiltration, Behr, 1990, ISBN 3-925673-87-3.
10. Eberhard Staude, Membranen und Membranprozesse, VCH, 1992, ISBN 3-527-28041-3.