Antifouling Zwitterionic Coatings on Reverse Osmosis Membranes
Technology #16765

Application

The invented Zwitterionic coating applied on commercially available RO membranes has enormous potential of providing ultralow biofouling surfaces.

Problem Addressed

Other anti-fouling coatings have been applied to various surfaces by processes that involve the use of harsh solvents. These solvents may cause damage to delicate substrate (such as RO membranes), cause unwanted surface tension in the deposited coatings and need additional evaporation processes for complete removal. The invented copolymer chemistry is the first-ever ultralow fouling coating developed by initiated chemical vapor deposition (iCVD), a solvent-less technique.

Technology

The inventors synthesized copolymer films – poly-4 Vinyl pyridine-co-Ethylene glycol diacrylate (p(4VP-co-EGDA)) via iCVD. Post-deposition surface treatment of the copolymner films with 3-bromoproionic Acid (3BPA) produced higher surface zwitterionic contents yielding poly carboxy betains (PCBs). PCBs have been reported to provide surfaces capable of reducing the surface adsorption of non-specific protein to ultralow level. Quaternization is performed on P4VP to obtain a neutral/near-neutral zwitterionic surface that is able to penetrate and degrade cell membranes of various microbes. EDGA is used as the cross linker to render the copolymer insoluble in water yet provide the higher hydrophilicity of the copolymer films. The functionalized (zwitterionic) copolymer film (p(4VP-co-EGDA)) has biocidal moieties (pyridinium ion) coupled with higher hydrophilicity to combat biofouling of the commercially available RO membranes.

Advantages

- Ease of applicability, excellent control and confirmance to surfaces via iCVD technique
- Solvent free process unlikely to damage delicate RO membrane
- Zwitterionic copolymer film provides ultralow biofouling surface

Categories For This Invention:

Chemicals
Water Treatment
Desalination

Intellectual Property:

255 Main Street, room NE 18-501
Cambridge, MA 02142-1601
Phone: 617-253-6966 Fax: 617-258-6790
http://tlo.mit.edu
Contact the Technology Manager: tlo-inquiries@mit.edu
Development of zwitterionic coatings that confer ultra anti-biofouling properties to commercial reverse osmosis membranes

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Inventors:
Karen Gleason
Rong Yang

Publications:

Surface Modification of Reverse Osmosis Membranes with Zwitterionic Coating for Improved Resistance to Fouling
Desalination
April 15, 2015
Surface-tethered Zwitterionic Ultrathin Antifouling Coatings on Reverse Osmosis Membranes by Initiated Chemical Vapor Deposition
Chemistry of Materials
February 7, 2011

External Links:

G-Lab
http://web.mit.edu/gleason-lab/index.html

Image Gallery: