CURF
CLEMSON UNIVERSITY RESEARCH FOUNDATION
curf.clemson.edu

Reduced Biofouling in Water Treatment Membrane Systems

(2015-021)

Uses Ultraviolet Radiation to Reduce Growth of Unwanted Bacteria and Biofilms

Market Overview

This approach reduces biofouling by using X-ray irradiation and ultraviolet-emitting materials to reduce bacterial growth and biofilms. Biofouling is a critical issue in membrane water and waste water treatment as it greatly compromises the efficiency of the treatment processes. It is difficult to control and results in increased operational costs and poor performance. Current anti-biofouling techniques involve chemical cleaning steps or antimicrobial surfaces which have proven inadequate over longterm operation for many feed waters. In contrast, Clemson University researchers have developed an anti-biofouling approach that can inactivate bacteria without introducing chemicals into the feed water and without pausing operation of the membrane treatment process. This is accomplished by incorporating radioluminescent materials onto the module feed spacers and applying an external Xray source to produce germicidal UVC within the membrane element.

Technical Summary

This approach reduces biofouling by using X-ray irradiation and ultraviolet-emitting materials to reduce bacterial growth and biofilms. Biofouling is a critical issue in membrane water and waste water treatment as it greatly compromises the efficiency of the treatment processes. It is difficult to control and results in increased operational costs and poor performance. Current anti-biofouling techniques involve chemical cleaning steps or antimicrobial surfaces which have proven inadequate over longterm operation for many feed waters. In contrast, Clemson University researchers have developed an anti-biofouling approach that can inactivate bacteria without introducing chemicals into the feed water and without pausing operation of the membrane treatment process. This is accomplished by incorporating radioluminescent materials onto the module feed spacers and applying an external Xray source to produce germicidal UVC within the membrane element.

Application

Reverse osmosis; water purification

Development Stage

Preliminary Prototype

Advantages

- Reduces biofouling in water treatment/membrane water systems, increasing efficiency and decreasing operation costs caused by degradation
- Uses ultraviolet radiation inside membrane modules, presenting a unique and effective approach to eliminating bacteria
- Allows membrane to operate at maximum water fluxes with less pressure demand, extending membrane lifetime

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Provisional	United States	14/882,773	NA	2015-021	Dr. Ezra Cates

About the Inventor

Dr. Ezra Cates

Assistant Professor of Environmental Engineering and Earth Sciences at Clemson University

Dr. Ezra Cates earned his Ph.D. in Environmental Engineering from Georgia Institute of Technology and his B.S. in Environmental Studies from the University of North Carolina, Asheville. His research interests include fundamental phosphor development for improving the efficiency of visible-to-UV upconversion; (2) applications of UV-radioluminescent materials to environmental technologies; (3) microbial inhibition and singlet oxygen photosensitization by silicon nanocrystals; and (4) material technologies for enhancing solar water disinfection for the developing world.

For more information on this technology contact:

Andy Bluvas
Technology Commercialization Officer
E: bluvasa@clemson.edu
P: (864) 656-5157