UT Engineering New Research Grant Award


Dr. Escobar


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Project	Studies on presence, influence and control of biofilms on desalination membranes
Investigators	Dr. Isabel C. Escobar Professor of Chemical Engineering Dr. Cyndee L. Gruden Associate Professor of Civil Engineering
Sponsor(s)	Department of Interior – US Bureau of Reclamation
Project Duration	October 2011 – November 2012
Sponsor Award Amount	$115,420

PROJECT SUMMARY

The major challenges in membrane desalination are the scaling and fouling of membranes. More efforts are needed to overcome these problems by understanding the basic mechanism that is responsible for their formation. There is a need to develop improved membranes, which would be less susceptible for scaling and fouling with high salt rejection. Better feed pretreatment processes must be developed and better operating conditions established. Improved anti-scaling and anti-fouling chemicals are thus required. Other challenges include developing membranes that can withstand high-pressure operation and tolerate chlorine. Desalination science objectives include some of the following:

- Investigate hybrid systems (membrane + alternative system)
- Develop fundamental approach to "membrane" design or alternative systems
- Explore active or smart membranes which remove only the contaminants
- Increase energy efficiency by 50%
- Reduce system costs: capital cost, operating cost, cost of zero liquid discharge
- By introducing better (passive and/or active) materials and understanding, seek to determine limitations of -and improve -current desalination systems or their combination, and to advance next-generation desalination methods
- Increase production efficiency (quantity of water produced per unit energy) and minimize environmental impact of concentrate (zero liquid discharge)

This proposed research will advance knowledge and understanding in the field of membrane science in numerous ways. While the ability to use specific blends of polymers for a particular application has been investigated before, this study aims to apply this concept to membrane formation to control biofouling. The method suggested here would not only advance the knowledge of membrane formation, but would also advance the understanding of the mechanism by which membranes are biofouled. If certain membrane polymer blends can be shown to have an effect on biofouling, then the properties imparted to these membranes can be investigated, leading to a better understanding of biofouling mechanisms. Furthermore, information on the properties of polymer blends will have great interest in many other fields, as polymer blends can be used to enhance physical, mechanical, and chemical properties in nearly any polymer based application.

Some of the benefits of proposed anti-microbial membranes include: (i) increased plant availability; (ii) reduced RO fouling rate, which leads to less frequent RO cleanings, and longer RO membrane life; (iii) higher RO flux; (iv) higher RO permeate water quality; (v) smaller, less expensive RO banks; and (vi) smaller footprint. To this end, the research plan intends to develop, optimize and evaluate the proposed anti-microbial membranes.

NGN: September 28, 2011

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