

# Workshop on Membranes for Water Treatment & Reuse

Saturday

8:00 AM

*Lecturers:*

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**Isabel C. Escobar**, University of Kentucky, [Isabel.Escobar@uky.edu](mailto:Isabel.Escobar@uky.edu)

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## ABSTRACT

Membrane processes are finding wide applications ranging from water treatment to reactors to advanced bio-separations. Membranes are particularly useful for material recovery and for permeate reuse (such as, water recycle). The workshop is configured as a one day program of about 6 hours of lectures. Both desalination and toxic pollutant removal/destruction techniques will be discussed. The workshop topics include membrane selection criteria, practical information regarding configuration, performance and operating conditions of membrane technology applied to desalination of brackish and seawater, and wastewater reclamation systems, mixed-matrix membranes, and advanced functionalized/responsive membranes from toxic metal capture to water detoxification. Membrane surface and pore functionalization approaches, reactive nanostructured for water detoxification will be part of the advanced membrane topics. The effects of feed water quality, pretreatment options, operating parameters and performance of membrane units and hybrid options will also be discussed. The workshop material will also include information on economics of membrane systems including drivers for membrane selection for various applications.

## OUTLINE

- Session 1  
Introduction to membrane theory  
Materials, configuration and performance
- Session 2  
Scaling and fouling phenomena  
Membrane Integrity and degradation
- Session 3  
Membrane water applications and pretreatment  
Membrane markets
- Session 4  
RO, NF, etc. for pollutants removal  
Graphene-based membranes and hybrid systems  
Materials recovery and water reuse
- Session 5  
Functionalized membranes for water area  
Toxic metal capture, and low pressure NF type separations (ex. As, Cr, from water)
- Session 6  
Membranes with nanostructured catalytic materials  
Advanced membrane-based oxidation/reduction for organic pollutant destruction
- Session 7

Module design and elements  
Drivers for membrane selection

## LECTURERS

**Isabel Escobar** is a Professor in the Department of Chemical and Materials Engineering at the University of Kentucky. In the field of membrane separations, she has been the PI of numerous membrane research projects, has one recently licensed patent on a breakthrough anti-biofouling feed spacer material. Isabel Escobar and her research group have published over 50 articles in peer-reviewed journals, and have made over 100 presentations at national/international conferences. She has edited two books, *Sustainable Water for the Future—Water Recycling versus Desalination* (ISBN: 9780444531155) and *Modern Applications in Membrane Science and Technology* (ISBN: 9780841226180). Escobar Chaired the 2006 American Water Works Association (AWWA) Desalination Symposium Chair, Honolulu, Hawaii, 21-22 May 2006; the NAMS 2007 Annual Meeting Chair, Orlando, FL, 11-16 May 2007; and the NAMS 2012 Annual Meeting Chair, New Orleans, LA, 9-13 June 2012.

**Dibakar Bhattacharyya (DB)** is the University of Kentucky Alumni Chair Professor of Chemical Engineering and a Fellow of the American Institute of Chemical Engineers. In December 2012, he was elected to the Board of North American Membrane Society. For 2010-2011 he was the Chair of the Separations Division of AIChE. He is the Co-Founder of the Center for Membrane Sciences at the University of Kentucky. He has published over 176 refereed journal articles and 21 book chapters, 2 books and Kirk-Othmar Encyclopedia chapter on Reverse Osmosis, and has 8 (3 full utility patents filed in 2012) U.S. Patents (Functionalized Membranes, green Synthesis, and one on hazardous waste destruction technology). He has worked with several industries in projects dealing with wastewater, material recovery, water reuse, and membrane separations. Dr. Bhattacharyya has received a number of awards for his research and educational accomplishments, including the 2009 Gerhold Award from the AIChE Separations Division for his outstanding contributions in Membrane Separations Technology Development, 2004 Kirwan Prize for Outstanding Research accomplishments, Larry K. Cecil AIChE Environmental Division Award for outstanding membrane technology developments in the water related field, and the University of Kentucky Great Teacher (1984,1996, 2008) Awards three times. At the 2007 NAMS Annual Meeting, he was honored for his contributions in the area of functionalized membranes. He has edited a new book on Responsive Membranes and Materials, published by John Wiley in January 2013.

**Ben Weaver** graduated from University of California, Berkeley with a BS degree in Chemical Engineering. He has spent his 8+ year career in various roles supporting membrane technology. Ben began his membrane career at Hydranautics where he worked on applications and development of hollow fiber and spiral wound MF and UF products used for treatment of seawater, wastewater, surface and ground waters primarily for pretreatment to NF/RO and drinking water. He spent 2+ years working on the Encina Seawater Pilot in Carlsbad, CA, future home of a 50 MGD desalination plant. He worked on applications for ethanol production as well as produced and seawater treatment for the oil and gas industry. He then started working for Nanostone Water (previously Ultura and Sepro Membranes) in an applications and sales role primarily focusing on process applications in food and beverage, industrial waste waters and specialty applications in energy and oil markets.