Nancy Lin Awarded First SCSC Fellowship

Fall 2007 - Hsiao-Yu Nancy Lin leads a busy life, but it is one that will significantly impact the future of desalination in the water industry.

In the 10 years since moving to the United States from Taiwan, she has earned a B.S. in Chemical Engineering from Rensselaer Polytechnic Institute in New York, and moved across the country to attend the University of California, Los Angeles (UCLA) for a Ph.D. in Chemical Engineering.

Currently entering her fourth year of doctoral research, Lin was named as the first Southern California Salinity Coalition (SCSC) Fellowship recipient for 2007.

"It's a great honor and big acknowledgement for what I do. I'm very excited," said Lin.

The SCSC Fellowship was established to support research in addressing the critical need to reduce salts in water supplies and preserve water resources in Southern California. Lin will receive $10,000 per year for 2 years to complete her research on "Development of Fouling/Scaling-Resistant Surface Nano-Structured Polyamide Reverse Osmosis/Nanofiltration Membranes."

She has designed a two-phase research project to examine commercial membrane surfaces to see what membrane property affects fouling and scaling, and then will use this information to modify the membrane surface. Fouling occurs when undesirable materials accumulate on the membrane surface, causing loss of performance. Scaling is a more specific term for the fouling phenomenon that is used to describe the accumulation of inorganic crystals, such as salt.

Membrane technologies have emerged in recent years as a viable and cost effective treatment alternative for difficult-to-treat water containing microbes, pathogens, disinfection byproducts, and high levels of salinity.

The research objective of Lin's project is to develop a new type of membrane with better fouling resistance, which will prevent the need to shut down water treatment facilities to clean membranes.

Completion of the first phase of the project is expected within a few months. So far, the results have shown rough surface topology to be more prone to scaling. The second phase will entail modifying the surfaces of existing commercial membranes, developing new backing, or using a new post-treatment process to increase surface smoothness.

One technique that Lin plans to use is graft polymerization, in which she will polymerize a thin brush layer on the existing polymer surface of the membrane. The brush layer will extend out of the membrane surface in a solution, such as water, extending the mobility of the polymers. With the polymers "moving" around, the possibility for ions to accumulate on the membrane decreases. The goal of the process is that, after the

modification, the membrane will be able to maintain at least its original membrane physical properties and will emphasize the anti-fouling characteristic. The expected completion date for her project is 2009.

So how does a young woman like Nancy Lin end up in the desalination industry?

Her academic inclination was evident in high school, when she applied for and won scholarships like the Time Warner Cable Scholarship and Continental Airline Leaders for the Millennium Scholarship. In college, she received an invitation to become a member of the Phi Lambda Upsilon Chemistry Honor Society. As an undergraduate, she already knew she did not want to study just pure science because she desired to make an impact in a real-world setting. The practical applications of an engineering degree appealed to Lin and, upon her arrival at UCLA, she was introduced to the water and wastewater industry.

Now she is working in a laboratory where about eight other graduate students and postdoctoral students are working on individual, yet related projects to contribute to the long-term goal of making desalination more feasible.

At present, Lin is finishing up the last part of the proposal for her topology study (Phase 1) to present at the American Institute of Chemical Engineers Annual Meeting in November 2007 in Salt Lake City, Utah.

After she completes her doctoral research project, Lin expects to fulfill her long-term goal of working in the emerging field of membrane development.

This article, written by Candace Stute, first appeared in the Fall 2007 edition of the Southern California Salinity Coalition Newsletter newsletter, *SoCal Salinity News*.