Lynn Trahey wins 2012 Northwestern-Argonne Early Career Investigator Award for Energy Research; $100,000

*Materials courtesy of Argonne National Laboratory*

ARGONNE, Ill. (June 7, 2012) -- Materials scientist Lynn Trahey of the U.S. Department of Energy's Argonne National Laboratory has received the 2012 Northwestern-Argonne Early Career Investigator Award for Energy Research for her proposal to investigate new materials to improve the performance of anodes in lithium-ion batteries.

The award honors a scientist working collaboratively between Argonne and Northwestern on research relating to energy production or use. Totaling $100,000 over three years, the award will enable Trahey to continue her pursuit of solutions to problems associated with energy storage. Northwestern University chemistry and materials science professor Tobin Marks will also collaborate on the project.

“This award recognizes that Trahey is capable of and will continue to accomplish work that has a tremendous impact,” said Argonne deputy associate laboratory director Stephen Streiffer. “That impact will be felt both in some of the most fundamental challenges in basic materials science, as well as in our attempts to help bring new batteries to market.”

Lithium-ion batteries have three components: a cathode, an anode and an electrolyte that separates them. Lithium ions flow from the anode to cathode as the battery is discharged, and in the other direction as the battery is charged. Improving the function of each of these materials – and the chemistry at the interfaces that separate them – will pave the way to more efficient batteries.

Popular anode materials, like graphite, have several drawbacks – they pose safety hazards and have a limited storage capacity relative to other possible materials, like tin and silicon. However, both of those materials need some development before they could become good alternatives; for example, they tend to irreversibly trap lithium ions as they cycle within a battery, Trahey said. “Since we only have so many lithium ions to start with when a battery is constructed, the goal is to keep what we have 100 percent viable.”

As a battery cycles, tin and silicon anodes also experience fluctuations in their shape, leading particles of the anode to break off. This “particle breakage” degrades the performance of the battery as more surface area of the anode is exposed.

To help combat this problem, Trahey and her colleagues will focus on creating a kind of buffer layer between the anode and the electrolyte that will prevent the buildup of lithiated regions, as well as model the surfaces to permit more fundamental studies of the atomic-level mechanisms at play. The
buffer layers are being developed currently in Marks’ laboratory. “Eventually, we hope that this leads to improvements both in handheld consumer electronics and in batteries for vehicles,” Trahey said.

Trahey came to Argonne from the University of California at Berkeley, where she completed her dissertation on the “Electrodeposition of Thermoelectric Nanowire Arrays into Customized Porous Alumina Templates” in the Department of Chemistry.

Funding for the award is provided jointly by Argonne and the Initiative for Sustainability and Energy at Northwestern University (ISEN).

“This award recognizes that collaborative relationships make for better science,” Marks said. “I’m hopeful as a researcher that these joint opportunities are the way that energy problems will be solved in the coming years.”

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About the funding institutions:

Argonne National Laboratory seeks solutions to pressing national problems in science and technology. The nation’s first national laboratory, Argonne conducts leading-edge basic and applied scientific research in virtually every scientific discipline. Argonne researchers work closely with researchers from hundreds of companies, universities, and federal, state and municipal agencies to help them solve their specific problems, advance America’s scientific leadership and prepare the nation for a better future. With employees from more than 60 nations, Argonne is managed by UChicago Argonne, LLC for the U.S. Department of Energy’s Office of Science.

DOE’s Office of Science is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, please visit science.energy.gov.

The Initiative for Sustainability and Energy at Northwestern (ISEN) was established in 2008 with the goal of catalyzing the development of transformational science, technology, education and policy for sustainability and energy. ISEN meets this challenge through interdisciplinary training, research, and local and global outreach. ISEN supports student and faculty research and outreach through a number of award and funding mechanisms, summaries of which are available on its website.