PNNL recognized for technology transfer

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RICHLAND, Wash. - The Department of Energy's Pacific Northwest National Laboratory has been recognized for its work in bringing lab-developed technologies to the marketplace. The award-winning partnerships are helping analyze trace amounts of gas, create the common chemical propylene glycol from plants and more easily study live cells.

The Federal Laboratory Consortium has announced that PNNL won three awards in 2011 for Excellence in Technology Transfer. The consortium is a nationwide network that encourages federal laboratories to transfer lab-developed technologies to commercial markets. The announcement brings PNNL to a total of 74 FLC awards since the recognition program began in 1984, which is more than any other federal laboratory.

Trace gas analysis without the noise

Knowing which gases exist in the atmosphere is critical to a number of fields, including climate research and pollution remediation. Quantum cascade laser systems, also called QCLs, are increasingly being used to identify and quantify atmospheric gas. But identifying gases in very small concentrations with QCLs is a challenge because "noisy" electronics interfere with the laser-based sensors that analyze gas samples. To tackle this problem, PNNL's Matthew Taubman developed a power-delivery device for laser-based sensors that drastically reduces random fluctuations, called "noise," in laser wavelength and line width.

The Low Noise Quantum Cascade Laser Current Controller enables scientists to more accurately detect smaller amounts of trace gases that would be otherwise impossible to measure. Controllers are the first step in the process used to analyze gas. First, the controller delivers power to a QCL, which then directs a beam into a tube containing a gas sample. A detector on the other end of the tube then measures what's left of the laser beam. Based on how much laser light is absorbed by the sample, scientists

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Wavelength Electronics, a supplier of laser system components in Bozeman, Mont., licensed PNNL's current controller in 2009. Wavelength promptly sold a few prototypes to Aerodyne Research Inc. of Billerica, Mass., for Aerodyne to use in its QCL systems. In October 2010, Wavelength began selling its own products that incorporated PNNL's current controller technology. PNNL's controller was specifically designed for QCL gas sensors, but it also has the potential to be used with laser diodes that could help detect microbes, scan for skin cancer, sequence DNA and take remote measurements.

Propylene glycol from renewable sources

Many everyday items from food to liquid detergents and cosmetics contain the additive known as propylene glycol. Commonly made from petroleum, the additive can also be made from plant byproducts. Funded by DOE's Office of Energy Efficiency and Renewable Energy, several PNNL researchers developed a chemical catalyst that converts a plant-based compound into the additive so well that an agricultural processing company has built a production facility around it.

Archer Daniels Midland Company licensed the catalytic process from PNNL in 2006 to help consumers kick the oil habit. Adding processes to clean out impurities, ADM built a pilot plant whose highly efficient process generates the additive from plant byproducts cheap enough to compete with propylene glycol derived from oil. Now, they're constructing the first full-scale plant to make propylene glycol from renewable sources. The Decatur, Ill., plant is expected to be fully operational this spring.

IncubATRTM, the live-cell monitor

Video available at http://www.youtube.com/watch?v=DIq2HUPi9Fg [3] .

Cultured cells are difficult to study in real-time because they need constant food, shelter and warmth to stay alive. Now, researchers have hooked up a cell culture incubator to a light-based spectrometer. The instrument can detect important biological and chemical changes in living cells that are invisible to the naked eye. The technology could speed up scientific discovery, reduce costs and curtail the need for live animal testing.

PNNL physical scientist S.K. Sundaram and his colleagues worked with Simplex Scientific LLC of Middleton, Wis., to develop IncubATRTM-the Live-Cell Monitor. With it, scientists can take advantage of an analytical tool called ATR-FTIR spectroscopy. The tool uses infrared light to examine internal changes to molecules - clues to the effect that drugs, chemicals or other experimental treatments are having on cells. Before the IncubATRTM, ATR-FTIR spectroscopy wasn't used on live cells because they need to be kept under life-sustaining conditions for hours or even days at a time. Transferring cells from an incubator to a separate ATR-FTIR spectrometer could also change the cells' environment and lead to undesirable results.

The IncubATRTM provides the right atmosphere for cells to thrive while a user's FTIR spectrometer takes measurements periodically and rapidly, nearly tracking changes in real time. For example, toxicologists could tell within a few minutes how live cells respond to nanomaterials. And researchers could learn how hormones affect cancer cells almost as it happens. In addition, the instrument keeps the cells in the same position for the whole experiment, which is key to acquiring reliable and reproducible data.

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