NETL-RUA
Regional University Alliance

E NEWS

Shared Intellect • Shared Laboratories • Shared Resources

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A Breathtaking Discovery: NETL Works with NIST and URS to Study a Carbon-Capture Sorbent that "Breathes"

Researchers at the National Energy Technology Laboratory (NETL) recently developed a new sorbent—commonly called "nickel bpene"—that takes up significantly more carbon dioxide (CO_2) than conventional sorbents do. That fact alone is enough to make nickel bpene intriguing, but it is not the sorbent's most astonishing attribute. What sets it apart is its breathing-like behavior. Its pores open as they "inhale" CO_2 and close as they "exhale" it. The sorbent isn't actually breathing, of course, but the changes its pores undergo in the presence of CO_2 are curious nonetheless. Because nickel bpene is so good at isolating CO_2, it shows enormous potential as a carbon-capture material.

Christopher Matranga

To get nickel bpene to divulge its secrets, researchers at NETL synthesized large, high-quality crystals of it so they could investigate the crystals' structure. "To solve structures, size is one issue—you need larger crystals—but quality of the crystal comes into play, so you need high-quality crystals," explains Dr. **Christopher Matranga**, a research chemist at NETL, who was on the research team. To address this issue, Dr. **Jeffrey Culp**, a researcher with URS Corporation (URS), set out to develop new synthetic approaches to make larger, higher-quality crystals. "We have made these crystals in the

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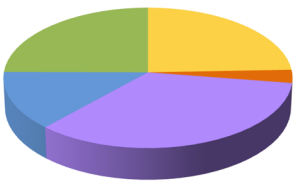
NETL-RUA
Metrics Snapshot

PRODUCTS			
	FY2011	FY2012	FY2013
Publications	194	195	50
Patents Issued	11	12	4
Licenses	9	4	0
Students Graduated	20 PhD	23 PhD	8 PhD
	8 MS	19 MS	1 MS

Product data is updated quarterly.

RESEARCH PERSONNEL



Total = 598

- Graduate Students - 146
- Undergraduate Students - 18
- University Researchers - 205
- URS Researchers - 80
- NETL Researchers - 149

E News is your monthly source for the latest information about NETL-RUA's research, activities, and other important news. If you have information that you would like to feature in future newsletters, send that information to

NETL-RUA-FB@netl.doe.gov

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Jeffrey Culp

past, but they were not large enough or crystalline enough to be useful for determining the positions of atoms in the material," says Culp. Because of the research team's efforts, NETL now has a map of every atom in the sorbent's pore network.

NETL worked with the National Institute for Standards and Technology during this research project. NETL also collaborated with URS, an NETL-Regional University Alliance (NETL-RUA) member organization. Being able to leverage the knowledge of scientists across agencies—a capability that the NETL-RUA facilitates—made it easier to examine the problem from several angles and increased the fruitfulness of the research.

The researchers' work on nickel bpene led to an article in *CrystEngComm*, a journal published by the Royal Society for Chemistry, this year (DOI: 10.1039/C3CE00017F). But, even more importantly, it may lead to a highly efficient, cost-effective method to slash CO_2 emissions, a possibility that can have us all breathing a little easier.

Technology Note

The Simulation-Based Engineering User Center (SBEUC) High Performance Computer is Open for Use

To obtain an account, please e-mail SBEUC-Access@netl.doe.gov and provide your name, affiliation, and phone number where you can be reached during the day. A member of the SBEUC support staff will contact you to train you on accessing and using this new resource.

Noteworthy Achievements

NETL-RUA Catalyst Wins Innovation Contest

On May 7, the Pyrochem Catalyst Company (PCC) was named one of three winners of the second annual Ben Franklin Shale Gas Innovation and Commercialization Center's Innovation Contest. PCC won the $25,000 top prize for their efforts in further developing the pyrochlore catalyst technology for commercialization. PCC, an NETL spinoff company, holds an exclusive license to the pyrochlore catalyst technology, which a team led by the NETL-RUA developed and patented.

The pyrochlore catalyst converts shale gas and other hydrocarbon fuels, such as natural gas, propane, and diesel, into synthesis gas—or syngas. The catalyst has the potential to revolutionize long-haul truck transport power, supply several military power applications, and generate electricity for homes and businesses. The demand for syngas is expected to rise due to its flexibility for power, chemical, and fuel production. NETL and PCC hope the commercialization of the technology will create high-technology jobs throughout the region, since the catalyst has a longer life span, produces higher activity, and saves on operating costs over previous technologies.

PCC's win comes after being named one of 12 finalists from a pool of over 70 applicants involved in shale-gas-oriented innovations in Pennsylvania. During the ceremony, the winners were commended for moving the shale industry forward and creating jobs across Pennsylvania and the region.

The NETL-RUA-led team and PCC will continue to collaborate to demonstrate the commercial viability of the pyrochlore catalyst and the potential it has to improve clean air emissions. The Innovation Contest win, along with the NETL-RUA team's 2012 Research Collaboration Award win for chemistry-related science or engineering for the catalyst, will continue to validate and raise awareness for the breakthrough technology that NETL and PCC have tirelessly worked to bring to the shale and energy industry.

PCC board member, Tim Fogarty (at left), is presented the award check for PCC's winning technology by (from left to right) Sherri Collins (Director of Innovation and Investments, Pennsylvania Department of Community and Economic Development), Bill Hall (Director, Ben Franklin Shale Gas Innovation and Commercialization Center), and Terry Engelder (Professor of Geosciences, Penn State University).

Noteworthy Achievements

Paul Jablonski: NETL's Sammie Award Finalist

NETL metallurgist Dr. **Paul Jablonski** is a finalist for a Samuel J. Heyman Service to America Medal (Sammies). The Sammies, which are awarded annually by the nonprofit, nonpartisan group Partnership for Public Service, recognize outstanding contributions in federal civil service. The 2013 finalists were announced at a congressional breakfast ceremony May 7 in Washington, D.C. Jablonski is one of five finalists for the 2013 Science and Environment Medal, which recognizes a significant contribution in activities related to science or the environment (including biomedicine, economics, energy, information technology, meteorology, resource conservation, and space).

The Sammies, named in honor of the Partnership for Public Service's founder, Samuel J. Heyman, are considered the "Oscars of government service."

Paul Jablonski

Jablonski, a member of the NETL-RUA Advanced Combustion research team, was selected for his leading role in developing a novel platinum-chromium alloy for use in coronary stents. The effort to develop this advanced stent has garnered several awards previously reported in these pages, including a 2011 R&D 100 award and a 2012 Secretary of Energy's Achievement Award. Jablonski, his NETL colleague Paul Turner, and Ed Argetsinger of URS (also NETL-RUA Advanced Combustion team member) worked for over ten years with scientists from Boston Scientific Corporation to achieve an alloy that is more flexible and corrosion resistant than previously existing stent materials; the stent is also more visible to X-rays, leading to improved clinical outcomes, better long-term prognoses, and reduced healthcare costs. Since its introduction in 2010, the stent has attained over $4 billion in sales and market shares of 45 percent in the United States and 33 percent globally.

Over much of the same period, Jablonski also worked with International Titanium Powder, LLC (ITP); other industry researchers from AMETEK and Red Devil Brakes; and federal scientists from NETL; Oak Ridge National Laboratory; and the U.S. Army Research Laboratory to refine ITP's patented Armstrong Process, enabling the inexpensive production of titanium powders, alloys, and plate; one result has been improved armor plate for the protection of warfighters. This titanium processing work received an R&D 100 Award in 2007.

Jablonski's other award-winning work includes the development of a cerium diffusion coating for corrosion resistance in solid oxide fuel cell interconnects, which earned him his second R&D 100 Award in 2010, following a patent in 2009. He has received three other patents for his metallurgical work as well as awards from the Federal Laboratory Consortium and the Carnegie Science Center.

Turner, who hired Jablonski into NETL in 2002, summed up his colleague for a 2011 profile in *Innovation*[1] as "a brilliant metallurgist [who] has an outstanding work ethic….It is a privilege to work with him."

[1] Janice Fink, "Paul Jablonski," *Innovation*, 9:5, October/November 2011.

Your favorite issues of the NETL-RUA E NEWS are now available on the MOSS and the NETL-RUA website (www.netl.doe.gov/rua)

Upcoming Events

- **NETL-RUA will hold its annual fall meeting, the 3rd Annual Energy & Innovation Conference on September 17, 2013**

  This conference will bring together business and industry leaders from the region and members of the NETL-RUA. The conference will be hosted by NETL-RUA in collaboration with Catalyst Connection.

NETL-RUA Regional University Alliance

CATALYST CONNECTION™ Your Strategic Partner for Manufacturing Growth

2012 NETL-RUA Annual Review Is Published

The *NETL-RUA Annual Review FY2012* has been published. The *Annual Review* discusses the Office of Research and Development's (ORD) major research accomplishments, as well as those of ORD's university and contractor partners. It covers activities that leveraged core research to bring in additional research funding, efforts to increase the impact of NETL-RUA research, and efforts to accelerate the commercialization of new technologies. It highlights collaborative educational initiatives and some of NETL-RUA's student researchers. Finally, it reports NETL-RUA statistics and operations, provides a listing of ORD joint research teams and personnel, and gives a bibliography of peer-reviewed publications. To access the *Annual Review*, go to http://www.netl.doe.gov/rua/about/NETL-RUA-Annual-Review-2012.pdf. The document is also available on the NETL-RUA MOSS.

URS Corporation Gives Out Three NETL-RUA Research Awards

On June 3, URS gave out three NETL-RUA research awards: the Innovative NETL-RUA Research Award, the Outstanding NETL-RUA Research Award, and the Award for NETL-RUA Student Travel. Taken together, the awards total over $100,000.

Dr. **David Greve** and Dr. **Michael McHenry**, of Carnegie Mellon University (CMU), and Dr. **Paul Ohodnicki**, Jr., of NETL, won the Innovative NETL-RUA Research Award for their proposal entitled "Demonstration of Magnetic Field Sensors Employing Advanced Magnetic Nanocomposites for Down-hole Drilling, Shale Gas Surveying, Power Electronics, and Grid Applications." The award recognizes promising research proposals that advance energy research not currently supported by NETL.

The Outstanding NETL-RUA Research Award spotlights a promising proposal that advances energy research in direct alignment with NETL's current program focus. It was awarded to Dr. **Dengliang Gao**, of West Virginia University (WVU), and **Peter Sullivan**, of Energy Corporation of America, for their proposal entitled "Innovative Fractured Reservoir Decomposition: Implications for Risk Assessment in CO_2 Storage and Shale Gas Exploration."

Seven graduate students won the Award for NETL-RUA Student Travel for presentations they delivered at conferences across the country. Virginia Polytechnic Institute and State University student **Sridharan Ramesh** received the award, as did **Kyri Baker**, **Matthew Curnan**, and **Clinton Noack**, from CMU. WVU students **Haibin Di**, **Payem Kavousi**, and **Emily Roberts** also received the award. The award provides science, technology, engineering, and mathematics students from NETL-RUA universities a chance to attend a professional conference, present the results of their research, and advance their professional growth.

Jinesh Jain—Exemplifying the NETL-RUA Mission

Jinesh Jain

Dr. **Jinesh Jain**, Research and Development Scientist with URS, is beginning a three-year adjunct associate professor appointment at NETL-RUA member organization, University of Pittsburgh (Pitt). The appointment in the Department of Geology and Planetary Sciences officially began January 1, 2013 and will last until December 31, 2015. Dr. Jain's appointment exemplifies the NETL-RUA mission of sharing intellect and resources across NETL-RUA member organizations.

Dr. **William Harbert**, chair of Pitt's Department of Geology and Planetary Sciences said plans for a graduate-level class on inductively-coupled plasma (ICP) analytical techniques are in the works; the class will highlight ICP-Optical Emission Spectroscopy, multi-collector inductively-coupled plasma mass spectrometer, and associated sample preparation techniques used in Marcellus Shale and carbon storage analysis. Dr. Jain notes that the techniques addressed in this class will be particularly valuable to NETL-RUA students and their projects. In addition to the Pitt students, some CMU students have also expressed interest in taking his analytical techniques class when offered.

"Jinesh's instrument class will be of very broad interest and is highly-anticipated by the departments of chemistry, biology, and within the engineering and medical schools." Dr. William Harbert, Chair- Department of Geology and Planetary Sciences, University of Pittsburgh

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