NETL-RUA
Regional University Alliance

E NEWS

Shared Intellect • Shared Laboratories • Shared Resources

December 2011
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NETL-RUA Researchers Receive 2011 R&D 100 Awards

Advances in fuel cells, carbon management, and coronary stent materials have received R&D Magazine's R&D 100 awards, which recognize the 100 most technologically significant products to enter the marketplace in the last year. The annual awards, known as the "Oscars of Invention," are selected by an independent panel of judges and the editors of R&D Magazine. NETL leads the national lab system in the number of R&D 100 awards earned for the size of the research workforce. This year, three research teams from NETL and its partners were given R&D 100 awards for technology innovations.

According to NETL's Research Director, Cindy Powell,

> **"A clear focus of NETL R&D, historically and currently, is on applied science, particularly the development of technologies that contribute to resolution of critical energy and environmental management needs."**

NETL-RUA, through its portfolio of research and contributing researchers, is receiving recognition for developing technology that opens up possibilities for solutions to some of the nation's most difficult technical challenges.

NETL's Chris Johnson and Randy Gemmen, along with WVU researcher Xingbo Liu received an award for technology that can contribute to manufacturability of solid oxide fuel cells (SOFCs). SOFC cells must be stacked together to generate enough power to meet demand. The cells are joined by interconnects to keep the individual SOFCs physically separate while

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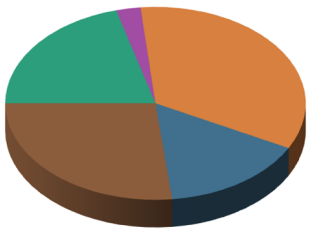
NETL-RUA
METRICS SNAPSHOT

CURRENT R&D PORTFOLIO	
Total Active Projects	176
Project Award Value	$16,764,241

PRODUCTS	FY2011	FY2012
Publications	194	
Patents	11	
Licenses	9	
Students Graduated	20 PhD	
	8 MS	

* Products data is "updated quarterly"

RESEARCH PERSONNEL



December 2011

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 julianne.klara@netl.doe.gov.

What's in This Issue

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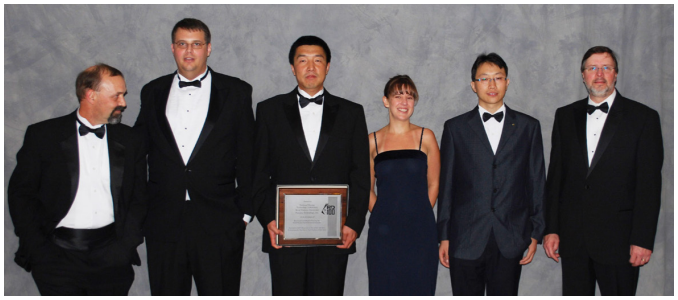
connecting them electrically. Chromium diffusion from existing interconnects leads to SOFC performance degradation. Preventing chromium from evaporating out increases the stack's lifetime, ultimately making the power generated less expensive for the consumer. The NETL team discovered that using a coating composed of (Mn,Co)3O4 spinel for interconnects offers significant advantages in cost, ease of application to large components, scalability for mass production, and environmental friendliness.



Pictured from left to right, Chris Johnson (NETL), Timothy Hall (Faraday), Xingbo Liu (WVU) , Heather McCrabb (Faraday), Junwei Wu (Harbin Inst. Tech–China), and Randy Gemmen (NETL) accept the award for their novel SOFC interconnect coating.

Steve Zitney and his research partners received an award for innovative simulation and visualization technology specific to the evolving needs of carbon management. Companies in the process and energy industries are increasingly relying on the use of sophisticated, computer-aided process design, simulation, and optimization tools to provide solutions to energy and environmental challenges. NETL's Advanced Process Engineering Co-Simulator (APECS) v.2.0 with ANSYS® DesignXplorer™ and ROM Builder tools can aid in the design and optimization of existing and next-generation plants for aggressive performance that meets strict economic and environmental objectives. This advanced process simulator reduces the time and cost needed to foster plant innovations by combining process simulation with fast reduced-order models based on high-fidelity equipment-scale.

Steve Zitney receives the award for NETL and ANSYS.

A third award went to a team headed by researchers at the Albany campus for developing advanced biomedical technology. NETL's Paul Jablonski, Paul Turner, and Ed Argetsinger, along with scientists from Boston Scientific Corporation (BSCI) developed a new material enabling production of advanced coronary stent products. For more than a decade, BSCI has worked with NETL in the area of advanced materials on research to improve coronary stents. BSCI and NETL worked together to develop a novel platinum/chromium (PtCr) alloy and design a process to produce the alloy for use as a stent material. The award is for a novel coronary stent that features a bold new grade of highly modified stainless steel with more flexibility, corrosion resistance, and strength uniquely suited for next-generation coronary stent products. The stent has become a boon to coronary specialists and their patients, promising longer, safer performance that could lead to increased lifetimes in coronary patients with arterial blockages. Since the introduction of the new PtCr coronary stents, BSCI has captured 45 percent of the world's market share, sales of which totaled over $1 billion in the first year of introduction. BSCI plans to utilize the PtCr alloy as a basis for their entire future stent line.

From left to right, Dennis Boismier (BSCI), Paul Turner (NETL), Charles Craig (BSCI), Jon Stinson (BSCI), Paul Jablonski (NETL) and Louis Toth (BSCI) accept the award for their stent alloy.

Strategic Growth Area Update

The NETL-RUA continues to pursue new areas of mutual benefit that leverage the capabilities and relationships of the Alliance or offer an opportunity to build unique capabilities all toward the goal of growing and diversifying the R&D portfolio. Each month, the newsletter will provide an update of the status of one of those Strategic Growth Area (SGA) initiatives.

Rare Earths and Critical Materials Research

Significant progress has been made on NETL-RUA's growth area initiative for Rare Earths and Critical Materials research.

Based on the topical paper developed by the joint NETL, URS, and university SGA Team in June, the NETL-RUA Executive Committee (EC) determined that this team should develop a business plan in preparation for potential upcoming funding opportunities. NETL-RUA's capabilities in mining and materials research are well-suited to address research focused on uncovering additional and cost-effective sources of rare earths and critical materials, as well as reduction or replacement with lower cost or more readily available materials. The business development approach, as adopted by the Rare Earths SGA team, is focused on successfully competing for a potential DOE energy hub. The collaborative Rare Earths SGA team has assembled a unique capability that includes a major materials industry partner and heavy participation by each NETL-RUA university partner. The business plan technical approach has been to assess each area of potential research need against collaboration capabilities. Where gaps were identified, additional partners, including academic partners, have been added to the team.

The Technical Lead for the Rare Earths SGA team, Dr. Roe-Hoan Yoon of Virginia Tech, made a presentation of a proposed business plan for Rare Earths to the EC on November 9, 2011. Based on the results of that presentation and the direction received from the EC, the Rare Earths SGA will continue preparations to build a successful team and develop a strong proposal for an anticipated DOE energy hub. Preparations by the SGA team may include performance of one or more joint rare earth and critical materials research projects within the NETL-RUA. These efforts will both evaluate potentially appropriate technologies and establish a record of collaborative critical materials research that will strengthen our collective response to a Rare Earths Hub solicitation or the pursuit of any funding opportunity, including industrial clients that may need NETL-RUA's expertise and facilities for materials research.

Combining Capabilities Accelerates Materials Research for Fusion Energy Systems

The Advanced Materials Strategic Growth Area Team plans to accelerate advanced materials research by capitalizing on a unique advantage of the NETL-RUA. That unique advantage is provided when the joint capabilities of the partnership enable research outcomes that exceed what could have been achieved by the partners alone. In response to a recent Funding Opportunity Announcement, DE-FOA 0000603—***Materials Solicitation with Focus on Structural Materials, Blanket First Walls, and Divertor Plasma Facing Components,*** to develop materials for advanced fusion energy systems, the Advanced Materials team proposed an accelerated materials research approach that links together NETL's capabilities for predictive computational modeling of material properties, Carnegie Mellon University's technique for rapid characterization of materials, and the unique testing in performance environments and prototype manufacturing processes available at Penn State and Virginia Tech. An accelerated materials research capability is particularly important for attaining the performance and durability required in the extreme environments of fusion energy systems where the opportunities to test new materials in performance conditions is limited. In an apparent validation of the strength brought to the table by the combined NETL-RUA capability, the team received notification from DOE's Office of Fusion Energy Sciences on November 18 to proceed with a comprehensive proposal.

The team, comprised of nine faculty members from Carnegie Mellon University, Penn State and Virginia Tech, and three staff members from NETL, proposed an exciting and unique method for rapidly evaluating a wide range of alloy materials for possible use in fusion reactor structural components. The methodology is based on the use of thin film deposition techniques developed by Carnegie Mellon University that enable high throughput production of alloys for analysis. These Composition Spread Alloy Film (CSAF) sample platforms (Figure 1) make it possible to fabricate and test all combinations of up to four component alloys quite efficiently. A library of CSAFs makes it possible to quickly evaluate a virtually unlimited number of materials combinations in order to focus on a small number of candidate alloys for further testing in high-energy neutron environments. One team member, Dr. Andrew Gellman of Carnegie Mellon University, stated that the CSAF approach will allow researchers to "reduce an entire universe of materials possibilities to a few promising alloy compositions in a tractable period of time."

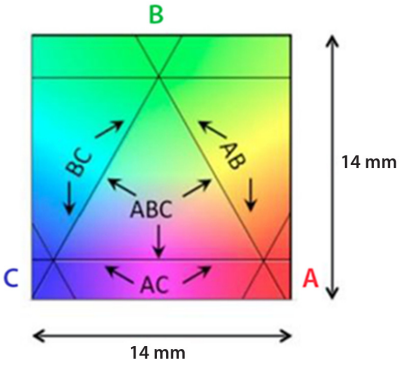


Figure 1

Materials research is only one core capability of the NETL-RUA collaborative that should be expanded to address the evolving industrial needs for advanced energy systems, particularly those necessary to enable breakthrough applications in sustainable energy technology. Linking together intellect, facilities, and resources of Alliance organizations is a powerful approach to successfully compete for shrinking federal funding and gaining new industrial clients, and is a strategy that should become a best practice within the NETL-RUA.

Research Team, Including Scientists from NETL-RUA Partners, Receives Coveted ARPA-E Project Award

A research team that includes members of the Grid Technologies Collaboration (GTC) Strategic Growth Area team has received an award from the Department of Energy's ARPA-E program for a proposal entitled "Nano-composite Magnet Technology for High Frequency MW Scale Power Converters." The proposal was submitted under ARPA-E's Solar ADEPT funding initiative to develop breakthrough technology for 'Lightweight, Solid-state, Medium-Voltage Energy Conversion for Power Applications.' The winning research project is led by Dr. Mike McHenry of Carnegie Mellon University (CMU). Additional research team members include Dr. Gregory Reed of the University of Pittsburgh (Pitt) Swanson School of Engineering and Paul Ohodnicki of NETL. Other team participants include the Los Alamos National Laboratory (LANL) and the Spang & Company's Magnetics Division.

Patterned after the highly successful Defense Advanced Research Projects Agency (DARPA), a high risk breakthrough technology program focused on military applications, DOE established the ARPA-E program to

explore creative "outside-the-box" technologies that promise genuine transformation in the ways we generate, store and utilize energy.

Although only in existence since 2009, DOE's ARPA-E program has energetically pursued its prime mission of helping to ensure U.S. technical leadership in advanced energy technology by filling in critical gaps in the energy innovation pipeline. As part of the DOE SunShot Initiative to reduce the total cost of utility-scale solar systems by 75% by the end of the decade, ARPA-E's Solar ADEPT program focuses on integrating advanced power electronics into solar panels and solar farms to extract and deliver energy more efficiently. The award made to the CMU/Pitt-led research team promises to produce power electronics components that incorporate nano-composites for reliable and flexible operation at a dramatically reduced cost. Historically, ARPA-E programs are extremely competitive and selective, with a small chance for success in terms of the number of concepts/proposals submitted versus awards, making this a notable award for this group of researchers.

The award is also important to the NETL-RUA for another reason. In its business plan for the Grid Technologies Collaboration initiative, the SGA team identified the importance of a 'quick hit success' as critical to solidify an NETL-RUA team and build collaborative research relationships. Leveraging the ARPA-E research award with an NETL-RUA-sponsored research effort focused on deploying power electronics and grid controls for the predominantly fossil-based electrical grid clearly presents the GTC with an opportunity to build a strong team with relevant collaborative research history.

NETL-RUA Member Receives First-place Gustav Eirich Award

Dr. Jinichiro Nakano, a URS Corporation Research Scientist, was awarded the First Place Gustav Eirich Award for his research efforts on "a comprehensive study of modern gasification slags and refractories used in gasifiers to guide the development of novel/improved lining materials" during an award ceremony at the 54th International Colloquium on Refractories in Aachen, Germany, on October 19, 2011, where he also presented his paper as an invited lecturer.

The award-winning research is an ongoing effort between NETL and Carnegie Mellon University (CMU), as part of the NETL-RUA collaborative.

The Gustav Eirich Award was initiated in honor of a German engineer, who invented an innovative mixing principle about 80 years ago. The award is presented by the European Centre for Refractories (ECREF) of Hohr-Grenzhausen, Germany, and Gustav Eirich Maschinenfabrik, the Hardheim, Germany-based engineering company, to promote the excellence of young academics and support innovative ideas in the refractories industry.

The award is presented annually to three candidates based on the discussion of environmental aspects, energy, economics, and other resources; the potential for significant impacts in the industry; design and modeling for practical application; and the processing aspects of the development. The main topics considered are the refractory-based topics of raw materials, materials and components, application technologies, and topics concerning the study of materials under the headings of "high-temperature materials" and "the modern refractory."

Dr. Nakano is a member of NETL-RUA's Advanced Gasification team. Prior to joining URS in August 2010, he was a senior research associate in the department of Materials Science at CMU working on a collaborative effort with NETL led by Mr. James Bennett (NETL-Albany). Nakano is a Japanese-born international researcher who earned his doctorate degree at McMaster University in Canada, with post-doctoral experience at the University of Leuven in Belgium before moving on to CMU in October 2007.

Upcoming Events

Dec 6, 2011 2–4 pm EST	Education Committee Meeting
Jan 5, 2012 9 am–4 pm	Joint Research & Business Development Committees Meeting
Jan 18, 2012 1–3 pm EST	Communications Committee Meeting
Jan 25, 2012 1–3 pm EST	Technology Transfer Committee Meeting

NETL-RUA Committee News

Six standing committees are charged with supporting NETL-RUA's research and educational mission through the collaborative implementation of program goals and day-to-day operations. Here's what the NETL-RUA Committees are up to:

Business Development Committee (Lead: Paul King)
Research and Development Committee (Lead: Cindy Powell)
A joint meeting of these two committees has been tentatively planned for January 5, 2012, at the University of Pittsburgh. Logistics are still being finalized. The objective of this meeting is to develop strategies that will guide and support growth of the NETL-RUA R&D portfolio. Members of the Government Affairs Subcommittee (part of the Communications Committee), also key to the support of these efforts, will be invited to attend. The strategic growth areas will be used to focus the discussion of committee roles and responsibilities toward expanding and enhancing the collective research agenda.

READ THIS

The Communications Committee (Lead: Juli Klara)
The Communications Committee needs your help! It is interested in developing success stories from the NETL-RUA community that highlight the abilities of researcher collaborations, world-class research equipment utilized in solving industry needs, and successful commercialization efforts. For those of you who want to tap your creative side, the Committee welcomes you to craft a new NETL-RUA logo that captures the intellectual capital and history of technological development that has taken place by working together toward energy challenges. All ideas for success stories or new logos can be forwarded to the Communications Committee through your institution's representative or sent directly to Juli.

The Education Committee (Lead: Juli Klara)
The Education Committee is exploring development of an energy-focused entrepreneur course that draws on the educational expertise within the Alliance's engineering, business, policy and law schools. The focus of this course will be to increase the researcher's ability to pursue energy-based development efforts with an understanding of industry needs and business savvy. The Committee is still in the early stage of investigating possible options for such a course, and feedback from the NETL-RUA community is welcome.

The Operations Committee (Lead: Paul Deffenbaugh)
The Operations Committee recently documented the list of operational issues that have been successfully resolved or that are being addressed with respect to the RES contract, under which all five universities are subcontractors to URS. NETL recently asked the universities to identify any remaining issues that are still problematic as it makes one last effort to address contract terms toward greater efficiency.

The Technology Transfer Committee (Lead: Jessica Sosenko)
Industry expects speed within its business interactions and transactions, and the Committee is pursuing efforts that will allow researchers to receive external funding quickly, as well as to spin technological advancements out to industry with agility. NETL-RUA's Technology Transfer Committee are pulling on their combined expertise to provide research agreements and business practices that will support new business opportunities pursued by the Alliance.