

Two NETL-RUA Inventions Win the "Oscars of Innovation"

National Energy Technology Laboratory (NETL) researchers thrive on pushing the energy technology envelope past the threshold of what was thought possible, thus it is no surprise that two technologies advanced through NETL's collaborative efforts and brought to the marketplace within the past year have been recognized with R&D 100 awards, also known as the "Oscars of Innovation."

The Envelope Please!

BlackGold® Nanocoating: This [nanocoating](#), applied to compressor airfoil surfaces of gas turbine engines, can significantly reduce material loss, resulting in improved engine performance and fuel efficiency. Researchers at MDS Coating Technologies Corporation designed the material and application process. By teaming with NETL Office of Research

and Development (ORD) researchers, **Cynthia Powell** and **David Alman**, and other strategic partners, they were able to perform the critical tests required to apply the protective coating to commercial aircraft. Now Federal Aviation Administration-approved, this nanocoating will potentially save the U.S. commercial aviation industry up to 100 million gallons of fuel each year.



Arc Position Sensing: Flaws in specialty metals used in aerospace and other advanced applications are often caused by solidification problems that arise during the melting and refining process. A common problem is arc constriction during

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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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Contact:

Julianne Klara

julianne.klara@netl.doe.gov

412-386-6089

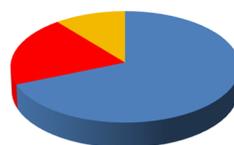
NETL-RUA METRICS SNAPSHOT

GRADUATIONS PER YEAR			
	FY2011	FY2012	FY2013
Students Graduated	20 PhD	23 PhD	16 PhD
	8 MS	19 MS	3 MS
	3 Bachelors	2 Bachelors	2 Bachelors

Student Researchers* involved in NETL-RUA Projects

Total = 166

- Doctorate - 114
- Masters - 34
- Bachelors - 18



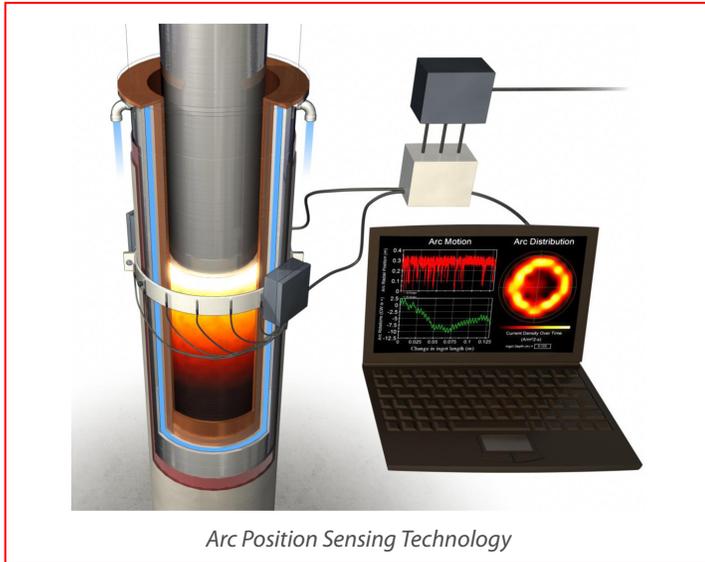
*Currently enrolled in specified degree program

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melting. The [Arc Position Sensing technology](#), developed by NETL ORD members **C. Rigel Woodside** and **Paul King**—with support from ATI-Albany Operations—allows operators to digitally monitor arc locations while melting and refining those metals, a technique that provides quality control critical for safety. By monitoring these arcs, potentially catastrophic defects in ingots are avoided. The technology may soon be used to help produce materials with stronger chemical and mechanical homogeneity, increasing the yield in the specialty metals and alloys used in the airline industry and other advanced applications.



Winners will be presented with plaques commemorating their achievements at the R&D 100 Awards Banquet on November 7, 2013.



Cynthia Powell



David Alman



Paul King



C. Rigel Woodside

Noteworthy Achievements

NETL Collaborators Patent Alternative Approach to High-Carbon Fly Ash Use in Concrete

John Baltrus, a research chemist in the NETL ORD Surface Science Division, along with Robert LaCount and Douglas Kern (Waynesburg University), was recently awarded a patent for a method of passivating the carbon in fly ash used for making concrete. Fly ash, a very fine particulate produced during coal combustion in power plants, is desirable as a partial cement replacement in concrete mixtures because it provides added strength and resistance to various corrosives. Since the enactment of emissions regulations in recent decades, fly ash has been captured from flue gas in large quantities and often winds up in landfills and storage sites.

Approximately 43 percent of the fly ash produced in the United States is recycled, much of it for concrete production. Air entrainment agents (AEAs) are added to increase the workability of concrete, but the high carbon levels in certain types of fly ash neutralize the AEAs through adsorption or chemical reaction, inducing escalated AEA usage in response. Baltrus and his colleagues developed a method for passivating the carbon in fly ash, which reduces the ability of the fly ash to adsorb AEAs without limiting its efficacy for concrete production. The method ultimately reduces greenhouse gas emissions and carbon utilization.

The patent, entitled “Fly ash carbon passivation,” is a beneficiation method that involves heating the fly ash to between 400 and 800 degrees Celsius (°C) in inert gas with up to 10 percent oxygen, as opposed to typical passivation treatment at over 800 °C in an oxidizing atmosphere. The reduced heating requirements and absence of carbon burnout result in greenhouse gas emissions that are lower than those produced when typical treatments are used to passivate high-carbon fly ash.



Sample of high carbon fly ash

Noteworthy Achievements



NETL Researcher and AICHE Fellow
Dr. Madhava Syamlal

NETL-RUA Researcher Named AICHE Fellow

Madhava Syamlal, PhD, NETL Computational and Basic Sciences Focus Area Lead, was recently named a Fellow of the American Institute of Chemical Engineers (AIChE). Dr. Syamlal has been a member of AIChE since 1983, and he has been a Senior Member since 1987.

AIChE Fellows are recognized for their professional attainment and significant accomplishments in engineering. They are nominated and recommended by various Fellows and Senior Members within AIChE, and Dr. Syamlal joins a distinguished group of more than 800 members from around the world.

Dr. Syamlal is currently involved with several projects in NETL's Computational and Basic Sciences area, including NETL-RUA's Multiphase Flow with Interphase eXchanges and the Carbon Capture Simulation Initiative research teams.

Student Spotlight



NETL Pathways Program Intern Earns PhD

On May 10, 2013, Circe Verba successfully defended her dissertation, "Potential Impacts of Formation Waters on the Integrity of Class H Cement and Reservoir Rock in Carbon [Co-] Sequestration Settings," before members of the Department of Geological Sciences at the University of Oregon. Dr. Verba, an ORD Pathways Program intern, examined the geochemical interactions of simulated sequestration brines under acidic, CO₂-induced conditions, on the wellbore environment. The Pathways Program is an innovative, developmental employment program targeting recent graduates. Participants have the potential to convert to full-time federal employment at the conclusion of their internship.

Dr. Verba's dissertation, which focuses on characterizing the risk of carbon sequestration on wellbore cement integrity, supported NETL-RUA's research for the American Recovery and Reinvestment Act through the U.S. Department of Energy's (DOE's) National Risk Assessment Partnership. Subsequently, a chapter of her dissertation was published as a special publication for the American Concrete Institute in Prague, Czech Republic.

Dr. Verba, supporting NETL's Engineered Natural Systems Division, plans to continue collaborating with Oregon State University on a carbon storage project examining microbial influences in the wellbore environment related to enhanced oil recovery and CO₂ conditions. Additionally, she is involved in NETL-RUA research teams associated with NETL's EPAct Unconventional Fossil Energy Resources and Ultra-Deepwater Research programs.



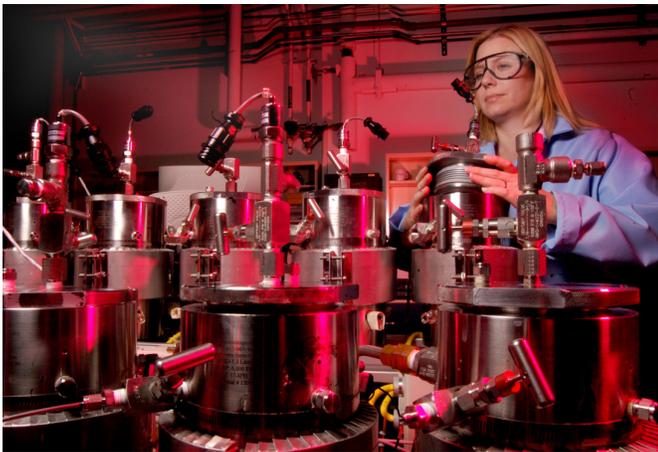
Dr. Verba uses a petrographic light microscope to examine the physical mineralization of basalt resulting from a CO₂ injection.

In the spirit of paying it forward, Dr. Verba is serving as an Oak Ridge Institute for Science and Education host for several student interns because, as she says, "the Pathways Program allowed me many similar career and development opportunities." The training and career development opportunities provided by the Pathways Program continue to help NETL gain valuable researchers, such as Dr. Verba, and assist students in gaining the experience they need to begin their career as soon as they complete their education.

Noteworthy Achievements

Justice Department Commends NETL-RUA Researcher

NETL scientist **Barbara Kutchko** has received a Certificate of Commendation for outstanding performance and invaluable assistance in support of the activities of the Environmental and Natural Resources Division of the United States Department of Justice. The award recognizes Dr. Kutchko for timely and expert presentation of data obtained from samples associated with the uncontrolled release event at BP's Macondo well in the Gulf of Mexico in 2010.



Barbara Kutchko uses a series of high-pressure vessels manufactured specifically for NETL's Geologic Sequestration Core Flow Laboratory.

Dr. Kutchko, whose NETL-RUA background includes research on foamed cements used in deep wellbores, was selected by agreement between industry representatives and the government to serve as a third-party unbiased expert in the ongoing litigation over the catastrophe. Her group worked on a very quick turnaround—in fact, their timeline was bumped up during the course of the research, necessitating an effective, quality effort with an emphasis on efficiency. The resulting data were presented without interpretation, to be interpreted by the litigating parties.

Currently, Dr. Kutchko is a member of the Materials Characterization Division Microscopic Analysis Team at NETL.

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

- The [3rd Annual Energy and Innovation Conference](#) will take place on September 17, 2013, at the Hilton Garden Inn, Southpointe, in Canonsburg, PA. The conference will bring together manufacturers, business leaders, researchers, venture capitalists, and environmentalists to collaborate and accelerate technology commercialization.

Registration for the conference is now open. Details, as well as a link to the registration page, can be found on MOSS and the NETL-RUA website.

**3RD ANNUAL
ENERGY & INNOVATION
CONFERENCE**
in search of the Game Changer

- [Carbon Storage R&D Project Review Meeting](#)
August 20-22, 2013
Sheraton Station Square Hotel, Pittsburgh, PA
- [2013 University Turbine Systems Research \(UTSR\) Workshop](#)
October 8-10, 2013
Purdue University, West Lafayette, Indiana

Department of Energy Announces Fraud Awareness Briefing

Join representatives from the U.S. DOE, Office of Inspector General (OIG) August 20, 2013, as they present a fraud awareness briefing related to their work investigating fraud in DOE funded projects.

Topics covered will include:

- The mission of the DOE OIG
- The OIG Investigative Authority
- Investigative Program Initiatives & Fraud Indicators
- Stimulus Funding
- An Overview of Recent Investigative Outcomes
- Questions and Answers

Specific WebEx information can be found on MOSS. Interested parties, please e-mail Sylvia Bergstedt at sylvia.bergstedt@netl.doe.gov.