

Science & Technology HIGHLIGHTS

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ORNL a Member of USAutoPARTs

ORNL's transportation researchers will soon have a presence in the heart of the North American automotive industry. ORNL staff will work directly with vehicle suppliers in the first U.S.-based open supplier partnership for precompetitive research.

The groundbreaking U.S. Automotive Partnership for Advancing Research and Technologies (USAutoPARTs) was formally announced at the North American International Auto Show in Detroit, Michigan, on January 17, 2008. Speaking at the announcement were Governor Jennifer Granholm of Michigan, DOE Under Secretary C. H. "Bud" Albright, President and CEO of the Original Equipment Suppliers Association (OESA) Neil DeKoker, and Delphi Executive Director and Chief Technologist Dr. Andrew Brown. Governor Granholm referenced ORNL's role in the Manhattan Project in proclaiming that this partnership can serve as a key element in a Manhattan-Project-like effort to address the nation's challenges in energy security, environmental sustainability, and economic competitiveness.

USAutoPARTs is a supplier-based, industry-driven partnership that will perform

precompetitive, collaborative R&D of clean and efficient vehicle technologies. The objective is to advance cost-effective emerging automotive technologies and ultimately speed their commercialization.

Membership in USAutoPARTs is open to any supplier with an established research or manufacturing presence in the United States. Suppliers will participate in defining the research projects and strategic direction for the partnership as well as participate in the research. The partnership is expected to include approximately 10 supplier companies within a year.

Initially, three research consortia are being formed to focus on advanced materials; electronics and hybrid vehicle technologies; and fuels, engine, and emission control technologies. The partners expect that USAutoPARTs will grow to address automotive safety, manufacturing efficiency, and additional vehicle technologies.

Michigan Governor Jennifer M. Granholm, ORNL Transportation Program Director Ray Boeman, and Associate Director of the ORNL Energy and Engineering Sciences Directorate Dana Christensen.



USAutoPARTs will operate its own research facility, the Vehicle



Systems Technology Research Center. The research center will be located in an existing 56,000 ft² R&D center located in Shelby Township, Michigan. Delphi Corporation is vacating the facility under its corporate restructuring program and is donating equipment and leaseholder improvements made to the facility. ORNL staff will conduct research at both the Vehicle Systems Technology Research Center and in Oak Ridge.

The center's laboratories and office areas can house approximately 200 researchers. Research staff will comprise loaned engineers and researchers from member companies, working side by side in various combinations with a small

number of dedicated DOE national laboratory researchers. The staff will grow as the number of research consortia projects increases. A small administrative staff will oversee the day-to-day facility operations and administration.

DOE, the U.S. Army Tank Automotive

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USAutoPARTs continued from p.1



Department of Energy Undersecretary Bud Albright at the USAutoPARTs rollout.

Research, Development and Engineering Center (TARDEC), a core group of suppliers, and the state of Michigan have committed to establishing and supporting the partnership. Suppliers

will contribute dollars and research staff based on the number of consortia they participate in. DOE will participate by funding ORNL and other national laboratory staff to collaborate with supplier members on research activities within the center. DOE has committed to provide at least \$9 million over a 4-year period. State-garnered resources will cover initial fixed costs associated with running the facility, allowing the federal and supplier commitments to directly support research, development, and commercialization activities.

USAutoPARTs is registered as a nonprofit corporation in the state of Michigan and is seeking federal tax-exempt status as a 501(c)(3) nonprofit organization. Organizational structure, governance, and membership provisions are being finalized by an organizing board comprising representatives from ORNL, OESA, the Michigan Economic Development Corporation, the Center for Automotive Research, Automation Alley, TARDEC, Wayne State University, Delphi Corporation, Visteon Corporation, and McLaren Performance Technologies. Ray Boeman, transportation program director, is ORNL's representative on the organizing board. A board of directors and executive director will be named in the coming months.

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Sponsor: DOE EERE Vehicle Technologies Program

Trucking Data Analysis Under Way

Assessment has begun of data collected during a year-long nationwide highway test of six instrumented Class-8 (i.e., more than 33,000 lb gross vehicle weight [GVW]) heavy trucks and ten instrumented trailers as they hauled freight nearly 700,000 miles. During the test, Michelin's new-generation, single wide-based tires were installed on some of the trucks to evaluate their performance and safety in comparison with conventional tandem tires.

The test, led by Bill Knee at the ORNL Center for Transportation Analysis (CTA) and conducted in partnership with Schrader Trucking Company of Jefferson City, Tennessee, was launched in October 2006 from the National Transportation Research Center (NTRC), which is a transportation research facility jointly utilized by ORNL and the University of Tennessee (UT). During the test period, the specially equipped tractor-trailers hauled freight across the United States on regular truck runs. On-board instruments recorded 1,800 pieces of information per second from the truck operations, which included the monitoring of 60 performance parameters, including speed, engine torque, fuel consumption, payload weight, weather, road grade, and location.

The special equipment on the instrumented trucks included a weather station, a global positioning system and a commercially available real-time self-weighing

system. On-board data acquisition systems measured each vehicle's performance, including vehicle and engine speed, engine torque, and fuel consumption. Physical variables such as wind speed and direction, road grade, and precipitation were also collected.

Testing at ORNL in 2006 indicated that the wider single tires would improve fuel efficiency and would contribute to tractor-trailer safety by enhancing stability. "We noticed that there was about a 2.9% fuel saving in using the new generation single

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Sue Nelson (Michelin), with a new generation single wide-based tire on one of the Schrader instrumented tractor-trailers.



wide-based tires over the standard dual tires,” says Knee, noting that the wider tires would benefit the consumer. “These trucks do 125,000 miles per year on the average. They currently get five miles per gallon. You can see there is a considerable amount of savings dollar-wise that can be realized through tires like this.”

The data will support modeling efforts for trucks of the future and will be made available to automotive engineers in the trucking industry as they work to develop safer, more energy efficient trucks. The data will also help DOE’s efforts in supporting future investments in energy efficiency technologies. Follow-on work in 2008 will involve the initiation of efforts to collect Class-6 (i.e., more than 19,500 lb to 26,000 lb GVW) medium truck duty cycle data. Vocations within Class-6 that will be addressed include delivery trucks, utility trucks, refrigerated delivery trucks, and school buses.

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Sponsor: DOE EERE Vehicle Technologies Program, Schrader Trucking, Michelin

Improved Productivity and Savings for the Investment Casting Process

ORNL’s Materials Science and Technology Division has worked with several industrial partners to validate procedures to obtain material properties that will be used to improve the yield from the investment casting process. The process consists of (1) making wax patterns by injecting wax into metal dies, (2) building molds by forming a ceramic shell around the wax patterns, (3) removing the wax from the molds, and (4) casting alloys in the molds. The properties obtained by using the validated procedures will be useful in predicting pattern tooling and casting dimensions for the investment casting process.

Dimensional changes between the pattern tooling and its corresponding cast part occur as a result of deformation of the wax,

DOE ITP Investment Casting Project Partners

- Schrey & Sons Mold Company, Inc., Valencia, California
- Buycastings.com, Dayton, Ohio
- Precision Metalsmiths, Inc., Cleveland, Ohio
- DePuy, A Johnson & Johnson Company, Raynham, Massachusetts
- Precision Colloids, LLC, Cartersville, Georgia
- Minco, Inc., Midway, Tennessee
- JEM Manufacturing, Long Lake, Minnesota
- S&A Consulting Group, LLP, Cleveland, Ohio
- M. Argueso & Company, Mamaroneck, New York
- Precision Castings of Tennessee, Inc., Gallatin, Tennessee
- Edison Materials Technology, Dayton, Ohio
- ESI North America, Bloomfield Hills, Michigan

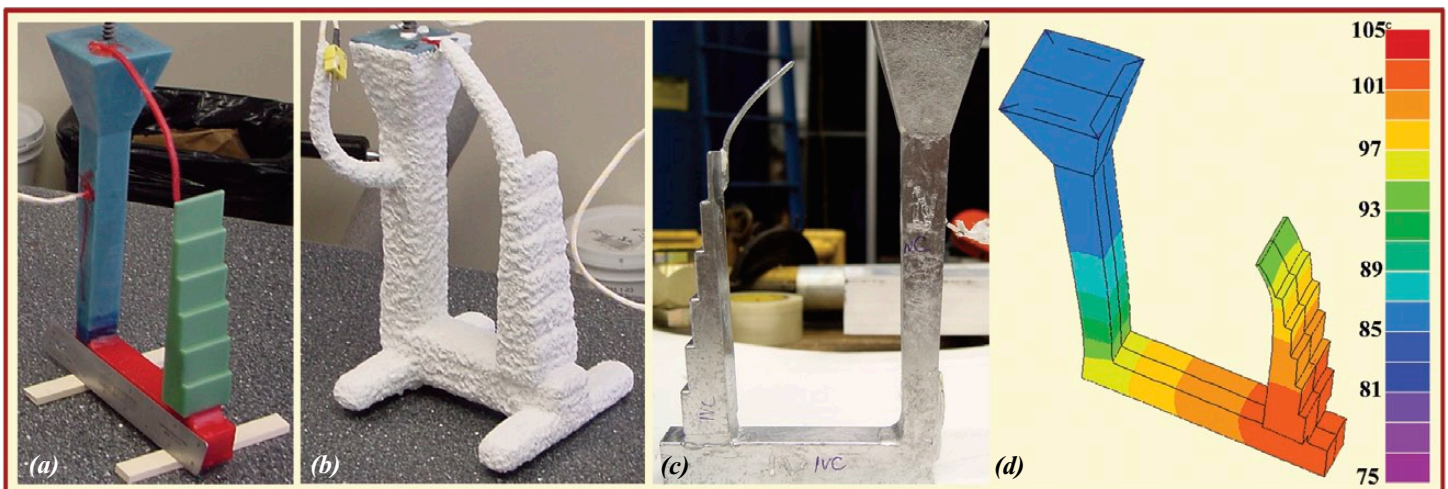
the mold, and the cast alloy. It was demonstrated for plant trials that thermomechanical properties of waxes can be measured and that accurate heat transfer conditions at mold surfaces can be evaluated based on first-principles theories. The alloy shrinkage factors were successfully predicted based on computer simulations by taking into account the thermomechanical properties of the alloy and shell mold materials. As a result of this work, new testing guidelines for waxes were developed and were presented to the Investment Casting Institute, and a viscoelastic module was implemented for the ProCAST™ casting simulation software and is currently being validated.

The ORNL methodologies eliminate the guesswork in conducting numerical simulations. The deployment and application of this technology will reduce trial-and-error runs in the casting design process, thus increasing productivity and reducing costs. It is estimated that an increase in yield from 55% to 65% and a reduction of scrap from 4% to 3% could yield a total energy savings of 7.6×10^{11} BTU/year in the production of steel, titanium, and aluminum castings.

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Sponsor: DOE EERE Industrial Technologies Program

Investment casting process (left to right): (a) wax pattern, (b) shell mold, (c) aluminum casting removed from the shell mold, and (d) model of temperature distribution and casting distortion. Deformation was magnified 15 times.



Six innovative ORNL EERE projects were the first to receive funding from EERE's new Technology Commercialization and Deployment Funding (TCDF) program. The program continues EERE's long and successful history of partnering with industry to commercialize energy-saving technology. TCDF support is matched by a 50% cost share from industry partners. The purpose of the program is to provide the necessary funding for prototypes and demonstration projects to progress from the laboratory to commercialization. The following technologies were selected for the initial round of funding.

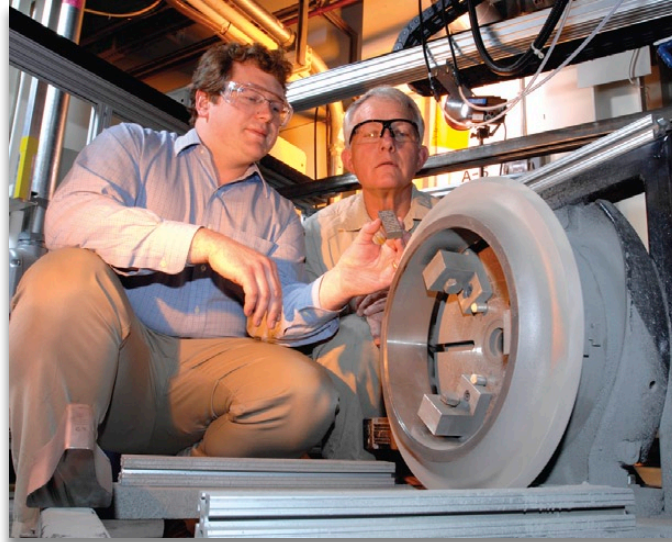
High Magnetic Field Processing

Working through ORNL and DOE Industrial Technologies Program (ITP) funding, a group led by Gerry Ludtka has developed High Magnetic Field Processing (HMFP), a revolutionary technique for treating materials that can produce stronger, lighter, and longer-lasting products by creating unique phases and microstructures in the materials. Jointly funded by TCDF and funds-in from Eaton Innovation Corp., Ludtka's project will develop magnetic processing on prototype components for the automotive industry. ORNL proof of principle results indicate that HMFP has the potential to reduce component weights by 20 to 50%, reduce residual stresses by 80%, extend component life by 30%, and improve energy efficiencies in power transmission by 20%. Project partners are American Magnetics, Inc., and Eaton Innovation Corp.



Gerry Ludtka with the HMFP device and samples.

Bill Peter (left) and Ed Hatfield with treated samples.



Highly Wear-Resistant Nanocrystalline Coatings for Steel

In a research project led by Bill Peter, an ORNL-developed laser fusing technology is used to apply highly wear-resistant nanocrystalline coatings to steel. The iron-based amorphous coating is applied

by depositing a glassy, iron-based bulk amorphous powder to the steel substrate and then heating it with a laser. The technology was originally funded by the DOE Office of Civilian Radioactive Waste Management with support from ITP and DARPA. The group has successfully used the technique to coat disc cutters for tunnel-boring applications; it will use the TCDF maturation funding to expand the technology to other industrial components, such as down-hole

drilling and mining applications as well as wire-drawing dies and wire rollers. Project partners are NanoSteel Company, Inc., and Southwire Company.

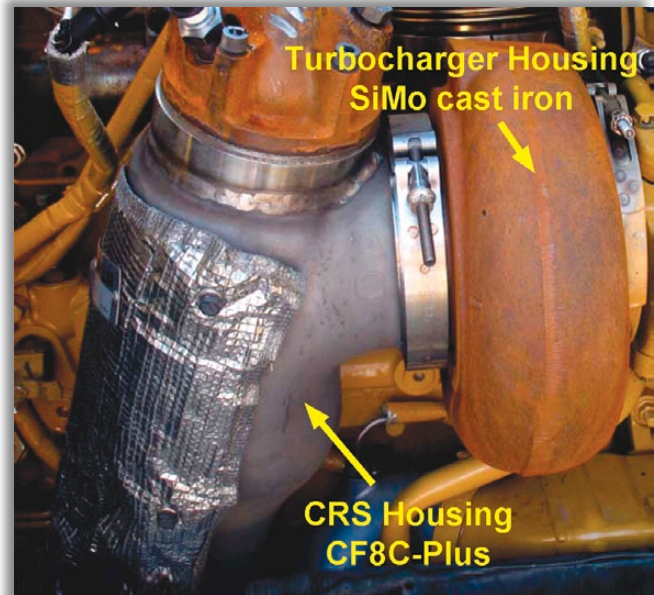
Thin-Section Stainless Steel Castings

Under the TCDF Program, a group led by Phil Maziasz and John Shingledecker will conduct the high-temperature fatigue testing needed to validate the performance boost of CF8C-Plus stainless steel in thin-section castings for turbochargers. The ORNL-developed cast alloy is already in use for the burner housings of the Caterpillar Regeneration System

(CRS), which enables the ceramic honeycomb filters necessary to remove exhaust particulates to keep working in truck diesel engines. The CRS units were deployed in January 2007 in response to new EPA regulations, and to date over 1 million lb of CF8C-Plus stainless steel has been cast for this one application. On Caterpillar diesel engines, the CRS is attached directly to the turbocharger. This project now

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CF8C-Plus Caterpillar Regeneration System housing attached to a turbocharger.



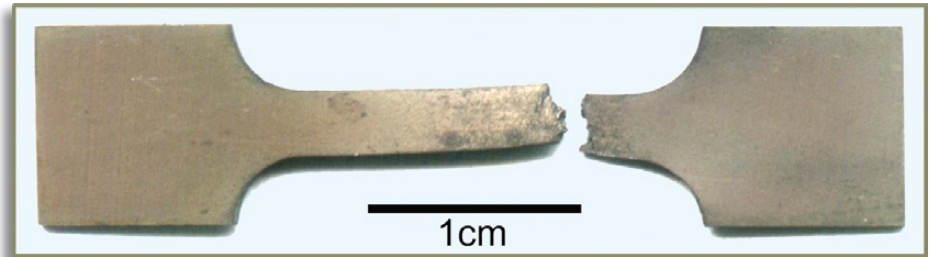
Maturation Highlights

seeks to extend the use of CF8C-Plus cast stainless steel to turbocharger housings, which operate at higher temperatures. The work was originally funded by a CRADA project between ORNL and Caterpillar on the FreedomCAR and Vehicle Technologies Program and now includes both Caterpillar, Inc., and Honeywell as partners. The development of the CF8C-Plus alloys received an R&D 100 Award in 2003.

Alumina-Forming Stainless Steel Alloys

A project to be led at ORNL by Mike Brady will manufacture and test alumina-forming austenitic (AFA) stainless steel alloys. These heat-resistant alloys could be used for turbine recuperators that would enable more efficient gas turbine engines. Heat-resistant AFA alloys were developed at the laboratory scale in work funded primarily by the DOE Office of Fossil Energy Advanced Research Materials Program and in collaboration with the DOE Distributed Energy Program and the Division of Materials Sciences and Engineering, Office of Basic Energy Sciences. The alloys exhibit creep resistance comparable to state-of-the-art austenitic stainless steels but have far superior oxidation resistance due to the formation of an Al_2O_3 scale rather than a Cr_2O_3 scale, which is what forms on conventional alloys. The current TCDF project, undertaken in partnership with commercial alloy vendors, will scale up the manufacture of AFA alloy plate, sheet, and foil by industrial processes. Prospective partners with whom CRADA agreements are being

The flexible RABiTST™ material is being adapted for use as a substrate in solar cells.



Very little oxide scale formation is evident on this AFA specimen after a creep rupture test. Specimen: HTUPS-4 (Fe-20Ni-14Cr-2.5Al wt % base) tested for 2191 h in air, 750°C, 100 MPa.

finalized include Capstone Turbine Corp., Solar Turbines, Ametek Specialty Metals, and Carpenter Specialty Alloys.

Continuous biodiesel reactor/separator team (left to right): Costas Tsouris, Joanna McFarlane, Joe Birdwell, and Hal Jennings.



Flexible Solar Cell Substrates

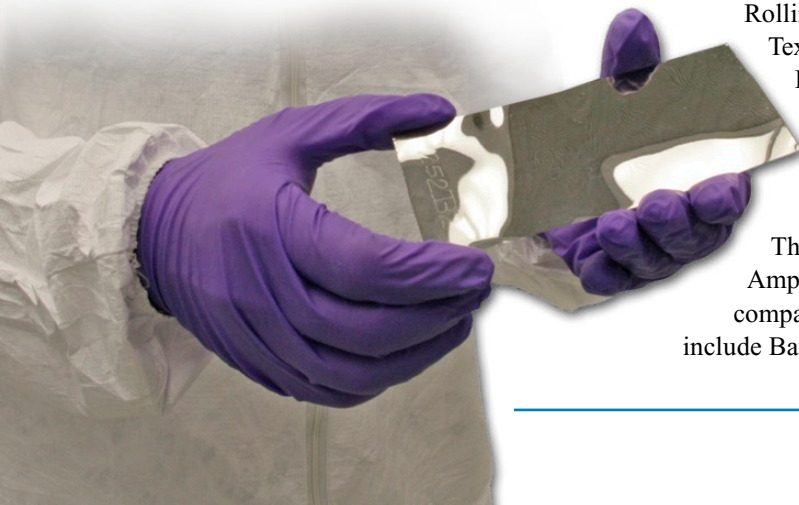
A TCDF-funded project led by Parans Paranthaman will work to develop flexible substrates for large-area solar cells. The research could substantially lower the cost of solar cell manufacture by providing an inexpensive substrate on which thin films of high-quality photovoltaic material can be deposited. The project will optimize the ORNL-developed Rolling-Assisted Biaxially Textured Substrate (RABiTST™) for deposition of photovoltaic materials in nearly perfect single-crystal thin films. The project partner is Ampulse, a venture-backed company whose investors include Battelle Ventures.

Continuous Biodiesel Reactor/Separator

A group led by Joe Birdwell has partnered with Tennessee biodiesel producer Nu-Energie, LLC, under the TCDF program for the demonstration of a continuous reactor/separator for biodiesel production. The reactor would improve production by enabling a continuous process for producing and recovering biodiesel from raw sources. It combines the hydrolysis and separation steps to perform continuous production of biodiesel (transesterification of glycerides) and the separation of synthesis reaction products. The work was initially developed through the Laboratory Directed Research and Development Program. Nu-Energie will be the commercial integrator of the technology.

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Sponsor: DOE EERE Technology Commercialization and Deployment Funding Program



Structural Characterization of Cathode Catalysts for Proton Exchange Membrane Fuel Cells

During 2007, research conducted at ORNL as part of the DOE EERE FreedomCAR and Fuels Partnership focused on the application of atomic-resolution, aberration-corrected scanning transmission electron microscopy (STEM) for the study of alloy cathode catalysts used in proton exchange membrane (PEM) fuel cells. These catalyst particles are composed of platinum that is alloyed with transition metals (M) such as cobalt, nickel, chromium, tungsten, or titanium and are being investigated as a cost-effective alternative to the platinum-only cathode catalysts used today in PEM fuel cells. The alloy nanoparticles have exhibited enhanced catalytic activities compared with Pt-only catalysts, which may be a result of several factors:

- the nature of Pt-M chemical bonding
- atomic coordination and atomic ordering
- surface and core structures
- particle morphology and faceting
- electron density in the Pt *5d* orbital

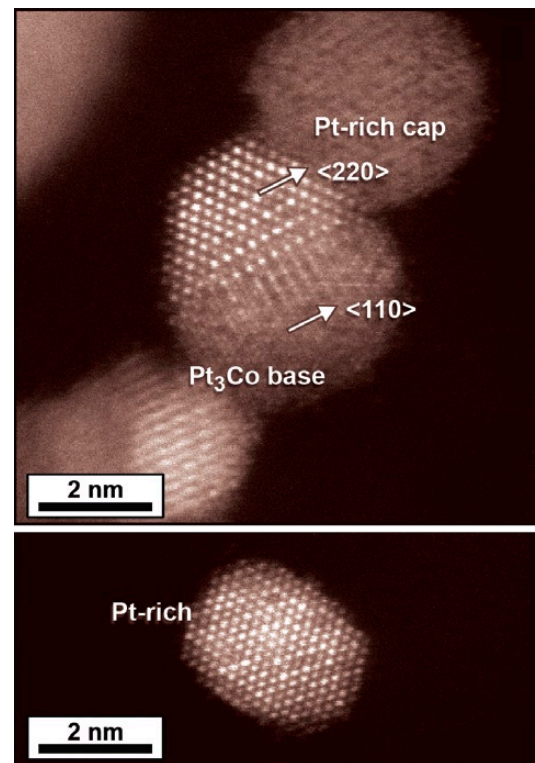
The JEOL 2200FS TEM/STEM at ORNL is capable of sub-angstrom resolution because the aberration corrector eliminates many of the distortions produced by spherical aberrations in the microscope's objective lens. A high-angle annular dark-field (HAADF) detector is used to collect electrons scattered to high angles, producing contrast in the STEM image that is dependent on the atomic number (Z) of the atoms that compose a material (the image contrast varies with Z^2). This technique, called "Z-contrast imaging," allows

for direct imaging of a material's atomic composition/structure.

In this FreedomCAR research, individual alloy Pt:M cathode catalyst nanoparticles supported on carbon are imaged (at extremely high magnifications) to produce HAADF-STEM images. In this way, the crystalline nature of individual nanoparticles, including surface/core structure, extent of order/disorder, and atomic coordination, can be easily interpreted.

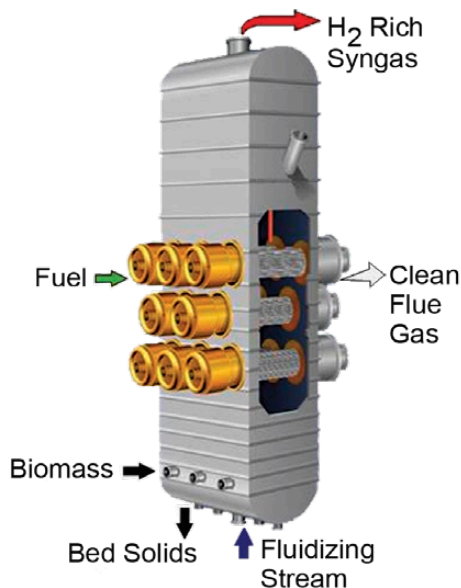
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Sponsor: DOE EERE Vehicle Technologies Program



Z-contrast (HAADF) STEM images of individual alloy catalyst nanoparticles composed of Pt-Co (< 4 nm). The Pt atoms are brightest because they have the highest atomic number.

Project Independence: A Biorefinery in a Paper Mill



Under Project Independence, a fluidized bed will be used for steam reforming of biomass at the NewPage plant. Adapted from an image provided by TRI, Inc.

Jim Keiser will lead the effort at ORNL in support of Project Independence, a DOE-funded endeavor in which an existing pulp and paper mill will be upgraded to process other biomass in addition to its feedstock of pulpwood. With DOE funding, NewPage Corporation will construct a demonstration facility in its plant in Wisconsin Rapids, Wisconsin, that will produce liquid fuel and other chemicals from waste wood and logging residue. Keiser and his colleagues at ORNL have a long history of working with the paper industry on the development and evaluation of structural materials that can withstand the hostile environment inside the mill equipment. They will provide technical support in the selection and evaluation of structural materials that can stand up to the environment inside the new system, which is expected to be even more extreme.

Pulp mills chemically treat a feedstock of wood to separate and purify cel-

lulose, which is made into paper. After the cellulose is collected, what remains is "black liquor," a solution of pulping chemicals and the residual biomass of the wood, much of which is lignin. Once considered a waste product, the black liquor was discarded and was a major pollutant of rivers. It became a valuable commodity in the 1930s, with the invention of the Tomlinson boiler, which can burn black liquor as well as other fuels to provide power to the mill. When black liquor is burned in a Tomlinson boiler, the biomass component is combusted, and the process chemicals accumulate in the firebox as molten salts. The salts are put into solution to form "green liquor" and are returned to the pulping process.

The Tomlinson boiler provides an elegant waste management method in paper mills, but it also has some drawbacks. It is the most expensive component in a paper mill and is relatively inefficient when fired

with black liquor. Also, the boiler can be hazardous because an explosion can occur if the water wall tubes develop a leak and the leaking water comes in contact with the molten salts. The purpose of Project Independence is to develop a safer, more efficient system while extending the range of biomass that can be processed in it.

The new system will use steam reformer and fluidized bed technology to produce synthesis gas (syngas). The syngas, primarily a mixture of hydrogen, carbon monoxide, and carbon dioxide, can be burned as fuel or used as the starting material for chemical synthesis. Steam reformer fluidized-bed technology (PulseHeater™) is currently in use at a paper mill in Canada, where it is used to process black liquor. Materials issues with both metallic and refractory components

encountered there have for the most part been successfully resolved through materials substitutions or design modifications developed, at least in part, at ORNL.

The steam reforming technology is capable of operating with types of biomass other than black liquor. The possibility of producing syngas from wood waste or forest residue or other types of biomass offers a means to increase the value gained from the trees that are cut for lumber and papermaking. If biomass other than black liquor is used as feed for the steam reformer, it should be possible to operate the fluidized bed at higher temperatures, where reactions would occur at a higher rate. Operation at higher temperature would likely shorten the processing time, but the corrosion rate of the reformer's structural components could also be accel-

erated. Therefore, selection of appropriate materials will be a critical issue. The materials testing at ORNL for NewPage and Project Independence will simulate the harsher environment anticipated for steam reforming of woody materials.

Estimated for completion in 2012, the upgrade of the NewPage plant will incorporate equipment for both the production of syngas from waste biomass and catalytic conversion of the gas into synthetic petroleum products (Fischer-Tropsch fluids). The technologies are scaled to fit within the existing infrastructure. The plant is expected to process about 500 dry tons of woody biomass per day to produce 370 barrels of product per day (about 5,500,000 gal/year).

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Sponsor: DOE EERE Biomass Program

Second-Generation HTS Cable Added to the Grid in Albany

On February 21, 2008, officials from the DOE Office of Electricity Delivery and Energy Reliability, the New York State Energy Research and Development Authority (NYSERDA), and county and city governments met at SuperPower, Inc., in Schenectady, New York, with representatives from the Albany high-temperature superconducting (HTS) cable team to commemorate the successful re-energization of the power cable. The team includes SuperPower, the National Grid utility (Westborough, Mass.), Sumitomo Electric Industries (Japan), and Linde (Germany). Funding for the project was provided by DOE, NYSERDA, and the project partners. The cable received a new section, which was fabricated from SuperPower Inc.'s second generation (2G) HTS wire, making it the first on-the-grid 2G wire-based HTS device in the world.

The Albany HTS cable, which runs between the National Grid's Riverside and Menands substations in Albany, has a total length of 350 m and operates at 34.5 kV. First energized in July 2006, the cable was installed in two sections, one 320 m long and the other 30 m long. Both were fabricated from first generation (1G) HTS wire. In 2007, during Phase II of the demonstration project, the 30 m section was replaced with an equally long section fabricated from SuperPower's new 2G HTS wire.

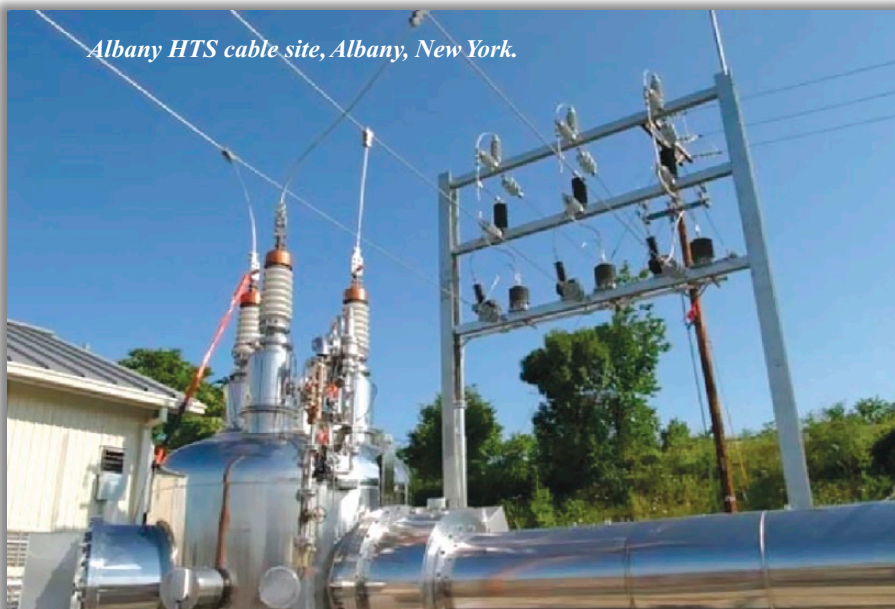
Compared with the inherently expensive 1G wire, 2G HTS wire has better performance and promises to be less costly to produce. The Albany cable project builds upon the recently announced licensing agreement between ORNL and SuperPower to use an ORNL-developed technology to lower the production costs of superconducting wires for more efficient transmission of electricity. SuperPower manufactured about 10,000 m of the wire for the Albany cable project, which represents the largest single delivery of 2G HTS wire to date.

The DOE Office of Electricity Delivery and Energy Reliability is leading the national efforts to modernize the

electric grid, enhance the security and reliability of the energy infrastructure, and facilitate recovery from disruptions to the energy supply. DOE Assistant Secretary for Electricity Delivery and Energy Reliability Kevin Kolevar said, "the Department is committed to continuing to work with academia, industry, and the states to advance High Temperature Superconductivity and other breakthrough technologies. High Temperature Superconductivity has repeatedly demonstrated that it has the potential to play a pivotal role in modernizing our electric infrastructure and ensuring the stable and affordable delivery of electricity to our homes, businesses, and industry. As the nation's demand for electricity continues to grow, so too do the pressures on our electric utilities to continue to provide the reliable electric service that is so important to our economy and way of life."

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Sponsor: DOE/OE Superconductivity Program



Albany HTS cable site, Albany, New York.

In Memory of Patrick Michael Martin, 1957–2007



Patrick Martin

Patrick M. Martin, an ORNL high temperature superconductivity research staff member, succumbed to cancer on December 28, 2007, after 5 years of courageous battle with the disease. A proud veteran of the U.S. Navy, Patrick began his career at ORNL in 1992 and was a dedicated member of the superconductivity team throughout his tenure. Ever an optimist, Patrick remained active at his job and in his volunteering efforts throughout his entire ordeal. Over the past 15 years, Patrick worked with and mentored students as well as teachers in the science and technology of high temperature superconduc-

tivity during the summers. In addition, Patrick participated in numerous laboratory-sponsored outreach activities to promote HTS technology and the pursuit of an education in the sciences. Beside these professional activities, Patrick was an ORNL division representative to the Knoxville Area Rescue Ministries, a volunteer with the National Park Service, the provider of musical accompaniment at his church, an instructor in the East Tennessee Whitewater Club, a co-organizer of the annual Paddle/Discovery Festival, and a full-time foster parent of three young children.

On April 30, 2007, Patrick received the President's Call to Service Award—the highest level of recognition given by our nation from the President's Volunteer Service Award Program. His was one of only 15 Call to Service Awards given to the entire DOE national laboratory system and site offices in 2007. Patrick was indeed a shining example of how volunteers, who, by their demonstrated commitment and example, inspire others to engage in volunteer service. Patrick will be sorely missed by all who knew and loved him.

ORNL, SuperPower Inc. Sign Wire Agreement

On January 9, 2008, officials from DOE, ORNL, and SuperPower, Inc., of Schenectady, New York, gathered at ORNL for a signing ceremony to execute a licensing agreement between ORNL and SuperPower. The agreement enables SuperPower to incorporate ORNL's lanthanum-manganese-oxide buffer into its manufacturing process to make high-performance second-generation (2G) high-temperature superconducting (HTS) wire cheaper and faster.

This licensing agreement is part of a national effort led by DOE to research, develop, and transfer energy technologies from DOE national laboratories to the global marketplace. Patricia A. Hoffman, DOE principal deputy assistant secretary for Electricity Delivery and Energy Reliability, said that incorporating 2G HTS wires and power equipment into the nation's electric grid will help meet rapidly growing demands for energy in an energy-efficient, cost-effective manner. "High-temperature superconductivity is a revolutionary and cross-cutting technology that can further the administration's long-term effort to transform our nation's electricity infrastructure and provide a safe, reliable, and affordable stream of electricity to all Americans," Hoffman said. "This licensing agreement continues the long history

of successes moving DOE technology from its labs to the marketplace."

"This agreement with SuperPower is a great example of ORNL working with industry and delivering the science and technology to help address the nation's energy challenges," ORNL Director Thom Mason said. Mason also cited the ORNL-SuperPower team's 2007 R&D 100 Award and 2007 Federal Laboratory Consortium Southeast Region Excellence in Technology Transfer Award as indicators of their joint success.

Venkat Selvamanickam, vice president and chief technology officer of SuperPower, said his company has worked under a cooperative research and development agreement with ORNL to incorporate this buffer technology into its

commercial 2G HTS wire as well as to enhance various performance metrics of its wire. "SuperPower has successfully integrated ORNL's buffer technology into our 2G wire manufacturing process," Selvamanickam said. "The license agreement provides SuperPower the opportunity to commercially benefit from this and ORNL's future advancements in 2G HTS wire technology." SuperPower's pilot manufacturing facility has yielded the

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Signing ceremony for the licensing agreement. Seated from left are Venkat Selvamanickam, vice president and chief technology officer of SuperPower, and Thom Mason, ORNL laboratory director. Standing from left are Tom Ballard, director of the ORNL Partnerships Directorate, and Patricia A. Hoffman, DOE principal deputy assistant secretary for Electricity Delivery and Energy Reliability.



world's longest 2G wire, and the wire has demonstrated world-record performance. Ten thousand meters of the wire have been fabricated into an HTS power cable

that has been installed into the power grid in Albany, New York; it is the world's first "on-the-grid" device demonstration of this technology.

Contact: Dominic Lee, 865-241-0775, leedf@ornl.gov

Sponsor: DOE/OE Superconductivity Program

Honors and Awards... Outstanding Mentors Honored

Three ORNL researchers within the OE and EERE programs, M. P. Paranthaman (OE), Md. S. Bhuiyan (OE), and Tom Watkins (EERE), received Outstanding Mentor Awards for their service to the next generation of scientists and engineers. They received the awards at the ORNL Outstanding Mentor and Education Champion Awards ceremony held in the ORNL Conference Center on February 5, 2008. William Valdez, Director of the DOE Office of Science's Office of Workforce Development for Teachers and Scientists, gave the keynote speech. ORNL Director Thom Mason and ORNL Deputy for Science and Technology Jim Roberto presented the awards.



M. P. Paranthaman



Md. S. Bhuiyan



Tom Watkins

Sponsored by ORNL and Oak Ridge Associated Universities, the awards honor the outstanding commitment that ORNL scientists and engineers make to students and teachers participating in the Laboratory's education programs.

ORNL EERE Staff Attend WIREC 2008



The ORNL EERE Program hosted an exhibit entitled "Providing Sustainable Energy Resources through R&D Partnerships" at the Washington International Renewable Energy Conference (WIREC) and Trade Show, held on March 4-6, 2008, at the Washington, D.C., Convention Center. The U.S. Government (including the Department of Energy, Department of State, Department of Agriculture, Department of the Interior, United States Agency for International Development, National Aeronautics and Space Administration, and Environmental Protection Agency) in collaboration with the American Council on Renewable Energy hosted WIREC 2008. The American Council on Renewable Energy, the leading U.S. renewable energy trade association, hosted the trade show. ORNL was among 246 exhibitors at the event, which was the largest all-renewable-energy business conference and exposition ever held in the United States.

Kim Grubb, (left, from ORNL) and Mike Sale (Sentech, Inc.) speak with a visitor at the ORNL exhibit at WIREC 2008.



President Bush, who spoke at the conference, noted the importance of renewable and alternative energy technologies to increasing America's energy security and to addressing the long-term challenge of global climate change. The president noted that during his presidency, "the federal government spent more than \$12 billion to research, develop, and promote alternative energy sources. Our private sector is investing a lot of money, and I fully understand there needs to be consistent policy out of the U.S. government that has thus far provided incentives to invest. What the government doesn't need to do is send mixed signals. I understand private capital, understand how it flows. And so when people look at the United States to determine whether we're committed to new technologies that will change how we live, they not only need to look at the federal investment, but

they've got to understand there's a lot of smart money heading into the private sector to help develop these new technologies."

Contact: Melissa Lapsa, 865-576-8620, lapsamv@ornl.gov

Sponsor: ORNL EERE Program

CALENDAR



2008 Tennessee Valley Corridor National Summit

One of the primary ways that the Tennessee Valley Corridor, Inc., advances ongoing collaboration and cooperation among key Corridor institutions, organizations, businesses, and elected leaders is through the Corridor's annual National Summit. This year's summit will be held on May 28–29, at the Von Braun Center in Huntsville, Alabama. ORNL-EE will be exhibiting at the summit.

Information and registration: www.tennvalleycorridor.org/summits/detail.html

INDUSTRIAL ENERGY EFFICIENCY SUMMIT

Helping U.S. industry improve energy efficiency and profitability

Industrial Energy Efficiency Summit

Reducing energy intensity in industrial facilities benefits industry and our nation. This summit, sponsored by the DOE, will set the tone for a nationwide commitment to industrial energy efficiency and carbon reduction. At this event, industry leaders will sign a voluntary pledge to solidify their commitment to reducing energy intensity in industrial facilities by 25 percent in 10 years. The summit will be held at Oak Ridge National Laboratory, June 4–6.

Information: <http://uat.cms.govtools.us/eeindustrialsummit/>

S&T Highlights is a communication of Oak Ridge National Laboratory's *Energy Efficiency and Renewable Energy (EERE)*, and *Electricity Delivery and Energy Reliability (OE) Programs*

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Organizational Announcements

New Divisions Formed, Directors Named

ORNL's Engineering Science and Technology Division (ESTD) has reorganized to form two new divisions, and two new directors have been named to head them. The reorganization took effect March 1, 2008.



Johney Green, Jr., has been named the director of the new Energy and Transportation Science Division (ETSD). In ETSD, R&D is carried out for a variety of energy and transportation research missions in the areas of building and industrial energy efficiency; electrical power research; fuels, engine, and vehicle research; and transportation analysis.



Kenneth W. Tobin has been named the director of the Measurement Science and Systems Engineering Division (MSSE). In MSSE, R&D is performed in measurement science associated with electronics, sensors, signals, patterns, informatics, and communications to develop methods, devices, instruments, and systems that interact with the world to interpret data, provide understanding, and impart control.

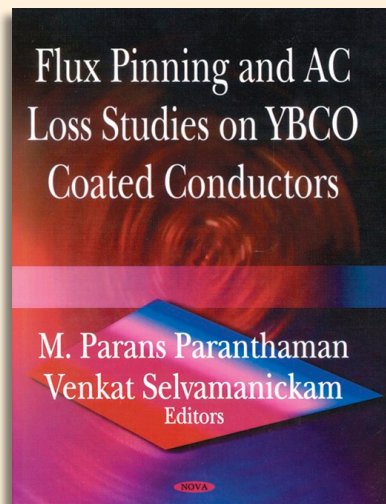
Craig Blue Appointed ITP Manager



Craig A. Blue has been appointed manager of the Energy Efficiency and Renewable Energy (EERE) Industrial Technologies Program (ITP) at ORNL. The mission of the ITP is to improve national energy security, the climate and environment, and economic competitiveness by transforming the way that U.S. industry uses energy. The four main program areas for ITP are energy efficiency

R&D, nanomanufacturing, fuel and feedstock flexibility, and technology delivery (including Best Practices).

COVER STORIES



Paranthaman Co-Edits Book on Superconducting Technology

The Chemical Sciences Division's Parans Paranthaman has co-edited a book on flux pinning and AC loss studies on YBCO-coated conductors. His co-editor is Venkat Selvamanickam, vice president and chief technology officer at SuperPower, Inc. The book, *Flux Pinning and AC Loss Studies on YBCO Coated Conductors* (New York: Nova Science Publishers, 2007), addresses some of the challenges outlined in the report of the Basic Energy Sciences Workshop on Superconductivity (May 8–11, 2006, www.sc.doe.gov/bes/reports/files/SC_rpt.pdf). The book provides an overview of second-generation high-temperature superconductor wires, including the current fundamental understanding of flux pinning and the status of research and development aimed at improving flux pinning and reducing AC loss.

ORNL ITP Projects Featured in TAPPI Journals

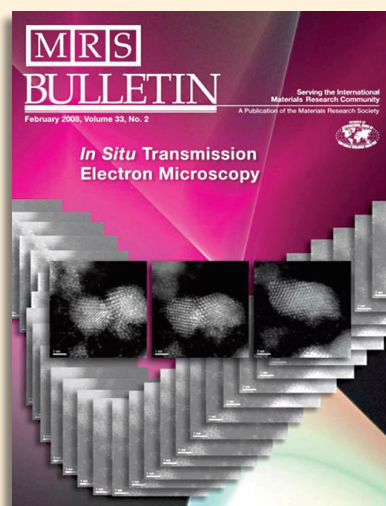
Two ORNL Industrial Technologies Program (ITP) Forest Products Portfolio projects were featured in the January 2008 edition of *Paper360*, a journal published by the Technical Association of the Pulp and Paper Industry (TAPPI) ("Oak Ridge National Laboratory Partners with Paper Industry," *Paper360*, 28–30, January 2008; www.paper360.org). The article focuses on ORNL collaboration with the paper industry and highlights two R&D projects. One section of the article, "Project 1: Microwave Pretreatment Increases Yield and Quality of Kraft Pulp Mills," describes research led by Alicia Compere; another, "Project 2: Materials for High-Temperature Black Liquor Gasification," describes research led by Jim Keiser. The article also highlights the range of ORNL facilities that are open to the forest products industry.

This coverage is the result of the participation by ORNL EERE ITP and the NanoApplications Center in tours of the Center for Nanophase Materials Sciences conducted as part of



the TAPPI 2007 International Conference on Nanotechnology for the Forest Products Industry, held at the Knoxville Convention Center, June 13–15, 2007, where both R&D projects were presented in poster sessions.

Also in January 2008, a photograph of Alicia's microwave applicator was featured on the cover of *TAPPI Journal* (Vol. 7, No. 1).



Platinum Nanoparticles on the Cover of MRS Bulletin

Micrographs of platinum nanoparticles taken at the High Temperature Materials Laboratory were featured on the February 2008 cover of *MRS Bulletin* (Vol. 33, No. 2). The images were acquired by ORNL researcher Larry Allard and researchers from the University of Texas at Austin as part of an HTML user project supported by the DOE Office of Vehicle Technologies. The images, which were collected at 20-second

intervals with the HTML's aberration-corrected scanning transmission electron microscope (JEOL 2200FS), show the coalescence of platinum nanoparticles under the influence of the electron beam. In addition to the platinum nanoparticles, individual platinum atoms and platinum clusters can also be observed. These studies will enable the development of catalysts with improved properties and performance.

News Briefs

Paul Dickerson Visits ORNL

On January 22, 2008, ORNL hosted DOE EERE Chief Operating Officer Paul Dickerson. Mr. Dickerson was presented with an overview of research and was given tours in the areas of Building Technologies, Industrial Technologies, and Transportation. He was also interviewed by local media.



At the ORNL Buildings Technology Center, Paul Dickerson (left) spoke with Bill Miller of the ORNL Energy and Transportation Science Division.

Alabama Power Company Visitors Tour ORNL

On March 6 and 7, 2008, ORNL hosted staff from the Alabama Power Company for tours of its energy efficiency and electric delivery facilities. The group was presented with an overview of ORNL and EERE-OE research, including the Save Energy Now program, and was given tours of ORNL's power delivery research facilities (distributed energy, conductor testing, and high-temperature superconductivity test facilities), the Buildings Technology Center, the Materials Processing Laboratory, and the near-zero-energy Habitat for Humanity homes in the Harmony Heights neighborhood, in Lenoir City, Tennessee.

Pat Love Directs International Conference for Eighth Time

Pat Love, a member of the Whole-Building and Community Integration Group, has directed the Thermal Performance of the Exterior Envelope of Buildings International Conference for the eighth time. This year it was held in Clearwater Beach, Florida, on December 2–7, 2007. It attracted almost 300 attendees.

The conference, held every three years, is sponsored by the DOE Walls, Roofs, and Foundations Research Program, housed at ORNL. The theme this year was “30 Years of Research,” representing 10 conferences and 30 years of reporting the results of research focused on building envelopes. The program consisted of three concurrent sessions of ASHRAE-reviewed research papers and was kicked off with a plenary session. Fourteen workshops were presented before and after the conference.

Christensen Named to Energy Policy Task Force

Dana Christensen, associate laboratory director for Energy and Engineering Sciences at ORNL, has been named to an energy policy task force for the state of Tennessee. Governor Phil Bredesen established the task force with the signing of an executive order on March 19, 2008. The task force is charged with developing a state energy plan to make Tennessee a leader in energy efficiency and conservation, use of alternative fuels and renewable energy sources, and the development of clean-energy technology.

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Science and Technology Highlights

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