The Fossil Report

Oak Ridge National Laboratory Fossil Energy Program — Summer 2003

Energy Technology for the Future...and for the World

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New Study Focuses on Cleanup of Produced Water

Discharge of produced water into the Gulf of Mexico is regulated, and the regulations specify that total oil and grease in the discharged water be below a daily maximum of 42 ppm.

Unfortunately, current methods for analysis of produced water for total petroleum hydrocarbons do not discriminate between recoverable oil and grease and water-

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International Materials Institute Launched

The **University of Tennessee** recently announced the creation of the International Materials Institute, made possible by a grant from the **National Science Foundation**. The $3.6-million grant establishes the IMI under the the name Advanced Neutron Scattering netWork for Education and Research (ANSWER).

(front) Dr. Peter Liaw (l) and Dr. Raymond Buchanan (r) of the UT Department of Materials Science and Engineering; (rear) Dr. Xun-Li Wang (l) with the Spallation Neutron Source; Dr. Hahn Choo (center) a MSE professor; and Dr. Camden Hubbard (r) with ORNL's Metals and Ceramics Division.

Photo courtesy of The University of Tennessee

The team receiving the funds is led by **Dr. Peter Liaw**, a professor in the Department of Materials Science and Engineering and a researcher on the Fossil Energy Program. Details of Liaw's fossil-related research can be read on the **Fossil Energy Program Web site**.

Other members of the team are Dr. Raymond Buchanan, Interim Department Head and Professor in the Department of Materials Science and Engineering; Dr. Xun-Li Wang with the **Spallation Neutron Source**, Dr. Hahn Choo, a professor in the Department of Mate-

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The Fossil Report is published quarterly by Paul Theodore Carlson, Oak Ridge National Laboratory Fossil Energy Program.

UNITED WE STAND

Fly Ash Tested for Use in Carbon Sequestration

By Anthony V. Palumbo
Oak Ridge National Laboratory

Collaborative work at **Oak Ridge National Laboratory** and **Pacific Northwest National Laboratory** is investigating the use of fly ash amendments to soils to increase carbon sequestration.

Tony Palumbo

Tony Palumbo, **Suzanne Fisher**, and **Jizhong Zhou** are the investigators at ORNL. James Amonette and Jana Tarver are pursuing this research at PNNL.

As there is concern that toxic metals may be released from fly ash and biosolid amendments, a series of experiments, designed to address this concern, were conducted through laboratory column leaching procedures.

The focus of the experiments was to determine if leaching of potentially toxic materials was influenced by mixing fly ash with soil and biosolids and if the biosolids could be a concern for release of metals.

Results from the simulated leaching were examined using a standard biosensor-based measurement technique for testing toxicity of water and soil. The tests showed there was little potential for leaching of toxic metals from the mixtures.

For more information on this work, please contact **Tony Palumbo**, Oak Ridge National Laboratory.

This work in sponsored by the **DOE Office of Fossil Energy**, **National Energy Technology Laboratory**.

Proceedings of Materials Conference Posted

The **proceedings** of the 17th Annual Conference on Fossil Energy Materials have been posted on the National Energy Technology Laboratory's Web site.

The conference, held in April 2003, included presentations and posters on the latest work in new alloys, functional materials, coatings and protection of materials, and materials performance and reliability.

Bill Steele Tells History of Bartlesville Thermodynamics Group
Click Image

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rials Science and Engineering; and Dr. Camden Hubbard with the **Oak Ridge National Laboratory Metals and Ceramics Division**.

Liaw comments that the mission of the IMI is to develop an international neutron scattering network for innovative multi-disciplinary materials research and education.

"The ongoing construction of the Spallation Neutron Source, as well as upgrades at the High Flux Isotope Reactor in Oak Ridge, provide a unique opportunity for UT to partner with ORNL to lead the way in the application of neutron scattering in materials research," Liaw said. "This is a powerful technique, particularly in the study of mechanical behavior of advanced materials."

Read more about this and other exciting materials research at the University of Tennessee in the **Tennessee Engineer**.

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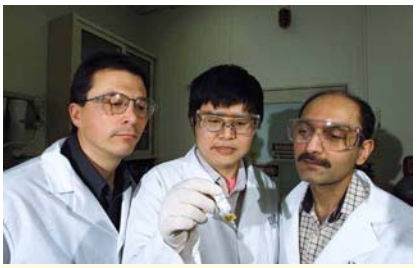
soluble organic compounds, mainly organic acids.

Close to a trillion barrels of produced water are treated each year.

Current techniques for cleaning discharged water involve the use of acids, termed acid springing. This technique, however, often has unpredictable results.

David DePaoli and **Joanna McFarlane** of the **Oak Ridge National Laboratory Nuclear Science & Technology Division** are working on a new approach to sampling produced water, through solvent extraction using ionic liquids.



David DePaoli (l) and Moonis Ally (r) are shown a vial of ionic liquid, synthesized by Sheng Dai (c).

Photo by Curtis Boles

If successful, this method could be extended to remediation of produced water, as a step which would follow acid springing and filtration.

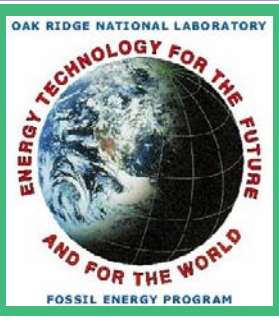
The produced water waste stream is of concern to all oil producers, large companies as well as the smaller independent producer.

Offshore and onshore facilities alike will benefit from the ability to remediate produced water using methods that are both efficient and cost-effective.

For more information on this activity, contact **David DePaoli** or **Joanna McFarlane**.

This work is supported by the DOE **Office of Fossil Energy**, **National Petroleum Technology Office**.

Click image to visit the Fossil Energy Program Web site



ORNL Fossil Energy Program Annual Report On-Line

The **annual report** of ORNL Fossil Energy Program in-house projects is now on-line.

The report covers progress from April 2002 through March 2003.

The report contains the details of progress during the past year in materials, fuel cells and functional materials, oil and gas, natural gas and carbon sequestration, coal combustion, and environmental analysis activities.

ORNL Inventors Honored

Earlier this year, three former and current Fossil Energy Program researchers were honored at Battelle's Columbus headquarters as "distinguished inventors."

This distinction was bestowed on them for having to their credit 14 or more patents.

Those awarded this honor from ORNL included **Tim Burchell**, **C. T. Liu**, and **Vinod Sikka**.

Burchell is still active on the Fossil Energy Program, doing research on the **development of novel activated carbon composites**.

Tim Burchell

C. T. Liu

Liu formerly headed Fossil Energy Program research on the development of iron aluminides. That

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ORNL Researchers Win R&D 100 Awards

ORNL Metals & Ceramics Division Bulletin Board

Maziasz

Phil Maziasz and **Bob Swindeman** of the ORNL **Metals and Ceramics Division**, and researchers on the **Fossil Energy Program**, are among those who used ORNL's uniquely-engineered microstructure alloy development methodology to drastically improve high-temperature durability, performance, and reliability of CF8C-Plus steel.

Swindeman

The collaborative work by ORNL, Caterpillar, and Solar Turbines, which won a 2003 R&D 100 Award, was funded by the DOE **Freedom CAR** and **Vehicle Technologies and Distributed Energy and Electricity Reliability** Programs.

However, the engineered microstructures methodology has roots in related work done on the **Fossil Energy Program**'s **Advanced Research Materials Program**.

This earlier work won a 1990 R&D 100 Award and was based on creep-resistant steels with special microstructures.

The method allowed them to change CF8C-Plus from a steel that could not be used past 600-650°C to steel which can be used up to 850°C, and which resists failure during creep, mechanical fatigue, and thermal fatigue.

A large number of companies will benefit from this improvement, because it is now a cost-effective product

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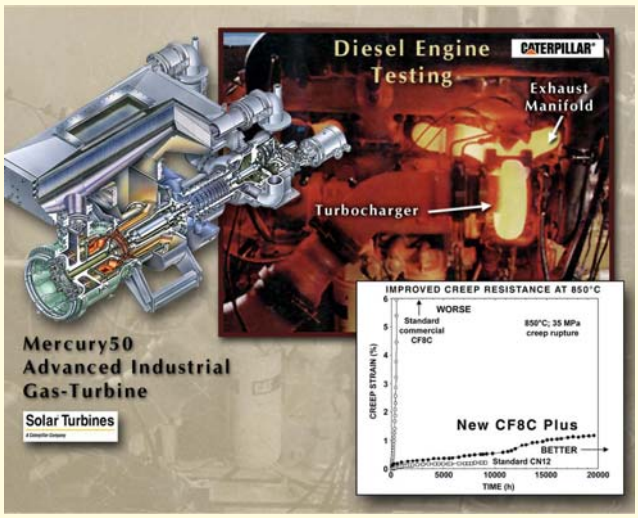
work still forms an important part of the Fossil Energy Program 's **Advanced Research Materials Program.**

Sikka was instrumental in the early work on fabrication and mechanical properties of Fe_3Al-based iron aluminides.

Vinod Sikka

with higher performance and significant dependability.

One such beneficiary of this work may well be the **Fossil Energy Materials Program** in the new efforts to develop cleaner, more efficient boilers and steam turbines, which can operate in ultra-supercritical steam conditions.



CF8C-Plus may be an advanced casing material for ultra-supercritical steam turbines, instead of the Cr-Mo bainitic and martensitic steels used today.

For more information, contact **Phil Maziasz** or **Bob Swindeman.**

"Every great advance in science has issued from a new audacity of imagination."

John Dewey, The Quest for Certainty