

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Paula Engelhardt, Physics
Co-PI(s): Margaret Phelps, Rural Education
Project Title: Visual Quantum Mechanics Workshop

Activation Amount: \$63,778.00

Agency: Tennessee Higher Education Commission

Tennessee Technological University in collaboration with 7 school districts proposes to offer a week long workshop, June 26-30, 2006, for up to 20 high school physics, physical science and chemistry teachers. The overall objectives for the workshop are to: 1) provide teachers a hands-on introduction to the Visual Quantum Mechanics (VQM) curriculum materials by having the teachers use the materials as students, 2) provide instruction to the teachers in the learning cycle approach of the materials, 3) provide the teachers with the necessary equipment for implementation in their own classrooms, 4) provide assistance with the computer simulations used throughout the curriculum materials, and 5) discuss issues associated with implementing the materials and pedagogy.

Visual Quantum Mechanics was developed to teach some of the formalism of quantum mechanics to high school students and non-science students at college level who lack a background in modern physics and higher-level mathematics. Students using VQM study the light-emitting diode (LED) in order to learn how it works. In the process, students develop a model of an atom and apply that model to solids and gases. This workshop will introduce teachers to the curriculum materials by having the teachers work through the materials as students so that they will develop the content knowledge necessary to teach the material. Although the materials were developed for physics teachers, VQM satisfies at least one Tennessee Science standard in each of the target areas: physics, physical science and chemistry, making it more widely applicable than just for physics.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Kristen Pennycuff, Curriculum and Instruction

Co-PI(s):

Project Title: Reading and Writing Institute

Activation Amount: \$74,121.00

Agency: Tennessee Higher Education Commission

The Reading and Writing Institute will provide an opportunity for practicing teachers to review, renew, and research literacy strategies for assessment, diagnosis, and remediation of students in third- through seventh-grade with reading and writing. Teachers will learn effective teaching practice based on scientifically based reading research in assessment and diagnosis, as well as techniques for correction in the areas of comprehension, vocabulary, decoding, and fluency in reading, as well as crafting, composing, and revising in writing. An emphasis on informational text and content area strategies will be provided. Teachers will implement new knowledge within the TTU Reading and Writing Institute as they assess and diagnose students' literacy skills and create an individualized intervention plan for a client in the third, fourth, fifth, sixth, or seventh grade. At the end of the intervention period, teachers will reassess and recommend future interventions for the students. Upon returning to their existing classrooms in the fall, teachers will be expected to perform the same procedures with at least two children in their classrooms, to implement content area strategies for enhancing literacy instruction, and to differentiate instruction through a series of projects and peer coaching strategies. Success will be evaluated through surveys and presentation of final projects at the fall meeting of the TTU Council of the International Reading Association.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Ying Zhang, Mechanical Engineering

Co-PI(s):

Project Title: A Novel Low-Temperature Diffusion Aluminide Coating for Ultrasupercritical Coal-Fired Boiler Applications

Activation Amount: \$54,395.00

Agency: U. S. Department of Energy

An ultrasupercritical (USC) boiler with higher steam temperature and pressure than current boilers is expected to increase the thermal efficiency of the coal-fired plant and also decrease emissions of air pollutants. Ferritic/martensitic steels have been developed with higher creep strength for the key components in coal-fired USC plants. However, they typically suffer excessive steam-side oxidation, which contributes to one of the main degradation mechanisms along with fire-side corrosion in coal-fired boilers. As steam temperatures further increase in USC boilers, oxidation of the tube internals will become an increasing concern. One approach to overcoming oxidation limitations is through the use of coatings, which are on the internal surface of tubes. As compared to overlay coatings produced by thermal spray or other techniques, diffusion coating technology offers two major advantages: (i) It constitutes the only viable way to add extra alloy protection to the inside surface of steam containing tubing surface without reverting to bimetallic tubing options; (ii) It is particularly attractive because the coating is incorporated into the metal substrate, thereby avoiding spalling or other loss of the coating protection.

Therefore, the main objective of this proposal is to develop a low-temperature (<700°C) diffusion aluminide coating with reduced brittleness via pack cementation for protection of USC boiler internal tubing, to compare the low-temperature aluminide coatings with model chemical vapor deposition (CVD) coatings in terms of oxidation resistance to water-vapor attack and coating microstructural evolution during thermal exposure, and to investigate the effect of the low-temperature aluminide coatings on mechanical properties of substrate ferritic/martensitic alloys, where very little knowledge exists.

The outcome of this research will not only offer improvement of steam-side oxidation resistance of USC boiler tubing components, but also provide a better understanding of the role of aluminide coatings on alloy mechanical properties. Also, through integration of fundamental, technological, and applicatory aspects, a low-cost alumina-forming coating will be developed for higher-temperature steam conditions. In addition, this research has direct relevance to industry and to the transfer of research to industrial practice.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Chunsheng Wang, Chemical Engineering/Manufacturing Center

Co-PI(s):

Project Title: T/J Technologies Battery Research-PROPRIETARY

Activation Amount: \$70,000.00

Agency: T/J Technologies, Inc.

Tennessee Tech University is working to identify and quantify electronic and ionic features associated with T/J electrode and composition and processing that differentiate their materials from other reported high rate electrode materials.

Principal Investigator: Glen Johnson, Engineering

Co-PI(s):

Project Title: College of Engineering Equipment Grant Fund 2005-06

Activation Amount: \$35,000.00

Agency: Tennessee Department of Commerce and Insurance

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Doug Talbert, Computer Science
Co-PI(s): Mike Rogers, Computer Science
Project Title: VEHI Subcontract with Vanderbilt

Activation Amount: \$149,137.00

Agency: Vanderbilt University (via AHRQ)

In this project, we will work with a team at Vanderbilt University to make steps toward enabling several of the Memphis-area hospitals to share clinical data in support of patient care through the establishment of a Regional Health Information Organization (RHIO). We will focus on developing the tools and techniques to evaluate the patient matching components of the system and on assisting in the design of a distributed architecture that will be as consistent as possible with the developing national guidelines. More specifically, we are developing a gold standard data set for use in evaluation and a toolkit that uses this data set to help us, in partnership with the team at Vanderbilt, to evaluate the tools and techniques that we develop, and we will be reviewing the recommended architecture standard from Markle and the Connecting Health initiative to determine how the technical architecture for Memphis RHIO needs to be structured to enable interoperability with other RHIOs.

Principal Investigator: Kenneth Currie, Manufacturing Center

Co-PI(s):

Project Title: Titanium Welded Bellows-Phase II

Activation Amount: \$76,768.00

Agency: Proprietary

The project involves development of a collapsible alternative to rigid sunshades which includes a study regarding the commercialization of the sunshade.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Xubin He, Electrical and Computer Engineering

Co-PI(s):

Project Title: Active/Active Metadata Server Research

Activation Amount: \$25,000.00

Agency: Oak Ridge National Laboratory

High availability is becoming increasingly important as clusters scale up in size and cluster-based storage systems are developed around a network-centered architecture. Data in general can be classified into user data and metadata. Metadata is the information about user data, including directory, mapping, data attributes, and so on. The availability of metadata is critical to achieve high availability of a system since the entire system may crash when the metadata is lost.

The metadata server which maintains the metadata of a parallel file system or of a distributed storage solution is an essential service and typically runs on a single head or service node. Since existing implementations were not initially designed to run on multiple service nodes using virtual synchrony, the goal of this research is to design a prototype of a highly available metadata server using symmetric active/active technology as a reference implementation for the parallel file system and distributed storage research community.

The project will investigate different metadata servers of existing file and storage systems, select one candidate file or storage system for modification of its metadata server to provide symmetric active/active high availability, and finally design a generic symmetric active/active high availability scheme for metadata servers of file and storage systems that can be applied to all or most of the surveyed metadata servers. The design will be based on previous work at ORNL in group communication systems and virtual synchrony by using ORNL's flexible, pluggable, high availability component framework. The design process will include the identification of metadata server states to be replicated and the identification of individual active decisions taken by metadata servers at runtime to be coordinated using distributed control.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Nasir Ghani, Electrical and Computer Engineering

Co-PI(s):

Project Title: INTERNATIONAL: Terabits Networks Workshop Held in Conjunction with IEEE INFOCOM 2006 Conference

Activation Amount: \$20,000.00

Agency: Oak Ridge National Laboratory via DOE

Principal Investigator: Glenn Binkley, Administrative Offices

Co-PI(s): Margaret Phelps, STEM Center

Project Title: Tennessee Technological University STEM Center

Activation Amount: \$1,290,000.00

Agency: NASA

Tennessee Technological University (TTU) proposes to construct a facility to house programs to improve the teaching and learning of STEM (Science, Technology, Engineering, Mathematics) disciplines P-16. The STEM Center is an interdisciplinary, campus-wide initiative of the University. Preliminary plans for the Center include four learning studios, an auditorium, a virtual theater, a lobby/display area, staff offices, and support areas. Learning studios will be used by staff and P-16 faculty to conduct scientific research on the STEM teaching and learning process, model best STEM teaching practices, conduct professional development for P-16 faculty, provide enrichment programming for P-16 students, and host exhibits and informal education activities for educators, students, and community members.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Francis Otuonye, Administrative Offices

Co-PI(s):

Project Title: Community Opportunities, Training, and Educational Services

Activation Amount: \$900.00

Agency: Upper Cumberland Human Resource Agency

Principal Investigator: Stephen Canfield, Mechanical Engineering

Co-PI(s):

Project Title: Capture Concepts and Model Development for MXER Tether Systems w/Model Development

Activation Amount: \$81,982.00

Agency: NASA

A team consisting of collaborators from Tennessee Tech University, MSFC, BD Systems and the University of Delaware (herein called the TTU team) conducted specific research and development activities in MXER tether systems during the base period of 5-1-04 through 6-30-05 under contract (number NNM04AB13C). The team addressed two primary topics related to the MXER tether system; development of validated, high-fidelity dynamic models of an elastic, rotating tether and development of feasible mechanisms to enable reliable rendezvous and capture.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Donald Visco, Chemical Engineering

Co-PI(s):

Project Title: Interpreting Student-Constructed Study Guides: A Constructivist/Constructionist Perspective

Activation Amount: \$2,000.00

Agency: Colorado School of Mines via NSF

In this work we look to interpret study-designed study guides in order to determine whether certain constructs relate to better examination performance. This qualitative work is to be performed using 10 students in ChE 3020 (Chemical Engineering Thermodynamics 2). Personal interviews and focus groups will be used to obtain feedback on preparation strategies.

Principal Investigator: Ghadir Radman, Electrical and Computer Engineering

Co-PI(s):

Project Title: Proposed Collaborative Research Between TVA and TTU and Graduate Student Support

Activation Amount: \$52,120.00

Agency: Tennessee Valley Authority

This project is to investigate appropriate modeling of dynamic loads for voltage stability analysis in an effort to protect the TVA system from possible future cascading voltage collapse events.

Grants Awarded

From 1/1/06 To 1/31/06

Principal Investigator: Sastry Munukutla, Energy Systems Research

Co-PI(s):

Project Title: Demonstration Project for Waigaoqiao 900 MW Coal-Fired Power Plant

Activation Amount: \$10,000.00

Agency: Shanghai Power Equipment Research Institute

This research deals with the demonstration project for 900 MW Super Critical Unit at Waigaoqiao Station near Shanghai, China. The scope of work includes the following:

1. Develop software based on Waigaoqiao Unit 6 configuration for predicting the coal flow rate and compare predicted coal flow rate to measured coal flow rate. The coal flow calculation will also be based on available flue gas composition data.
2. Develop software for calculating reheat steam flow rate in real-time based on temperature, pressure and flow rate of feedwater and mainstream, extraction pressure and temperature, feedwater heater drain temperature and pressure, and finally the pressure and temperature of feedwater entering and leaving the top feedwater heater.
3. The team of TTU experts (Sastry Munukutla, Steve Idem, Jie Cui, and Robert Craven) to visit Waigaoqiao Station and assist in installing the above mentioned softwares. The executable versions of the software will be supplied and no source code will be given.