

## State-of-the-Art Imaging Facility Features New-Generation Electron Microscope

### Project Involves International Partners

Oak Ridge National Laboratory (ORNL) has embarked on a project with JEOL USA, Inc. (a subsidiary of JEOL, Ltd. in Japan, a leading manufacturer of electron microscopes) to construct the first of a new generation of electron microscopes. This “aberration-corrected electron microscope” (ACEM) (see Figure 1) will employ specially designed electron optical elements. These elements will allow aberrations of the electron lenses to be corrected to provide image resolution of better than a single atomic diameter. CEOS GmbH of Heidelberg, Germany, developer of the world’s first practical aberration corrector, will provide the technology for the ACEM. The Department of Energy’s (DOE’s) Office of Energy Efficiency and Renewable Energy, FreedomCAR and Vehicle Technologies Program, is funding the project.

### State-of-the-Art Facility Minimizes Interferences

ORNL is funding the construction of a new laboratory building to house the new ACEM, as well as a number of present-day and future ultra-sensitive world-class instruments. The laboratory (tentatively called the Advanced Materials Characterization Laboratory) (see Figure 2) will be comprised of four instrument rooms designed to minimize the influence of magnetic fields, microphonics, air flow, foundation vibrations, and temperature. The aim is to have the microscopes controlled from separate rooms, and to allow full Internet access to the instruments so that users can gather data either using local control systems or via remote access from their own offices. Recently, the design firm of Barge, Waggoner, Sumner, & Cannon, Inc., prepared the construction drawings for the building based on requirements submitted by ORNL scientists and engineers. Site preparation work has been completed. Construction was initiated by Blaine Construction Corporation in July 2003. Construction is planned to be completed and the building formally commissioned in March 2004.



**Figure 1. Aberration-corrected electron microscope (ACEM).**



**Figure 2. Advanced Materials Characterization Laboratory (AMCL).**

### **Microscopes Provide Unprecedented Resolution**

The ACEM will be utilized in research supporting the High Temperature Materials Laboratory Users Program and other DOE programs that require imaging and chemical analysis of materials microstructures at the atomic level. University and industrial research programs and ORNL research programs (i.e., in catalytic science for emissions reduction and for chemical synthesis, development of novel nanostructured materials, electronic materials, composite materials and alloys, and fuel cells) are expected to use the advance-imaging capabilities of the new world-class electron microscope. Electron optical instruments in the facility will provide unprecedented resolution, allowing visualization of structures to the atomic level.

*Point of Contact:*

Arvid E. Pasto  
Oak Ridge National Laboratory  
865-574-5123  
pastoae@ornl.gov