

UNR imaging microscope to enhance advanced manufacturing, research

By Mike Wolterbeek

A group of UNR scientists and engineers is getting a million dollar microscope, the only one of its kind in Nevada.

It's the latest generation of focused ion-beam scanning electron microscope. Several projects are under way at the university that will use the new equipment, and it opens new avenues of materials and advanced manufacturing research.

Professor Dhanesh Chandra has been trying for several years to get funding for this specialized microscope. He just finished a three-year research project using FIB and Atom Probe tomography analyzing materials, and had to travel to Northwestern University in Illinois to use their machine for his work.

"Having this machine on campus will enhance the research productivity immensely, both for our students as well as for others here at the university who need it for their research," Chandra, who works in the materials and chemical engineering department, said.

The room-sized system, funded through the Major Research Instrumentation grant from the National Science Foundation, meets a critical need as a tool for synthesis, characterization and fabrication for materials and devices at the nanometer-to-atomic length scales. It can produce ultra-high resolution images for characterization and the fabrication of these structures.

"It has very broad applications; it's interesting to basic

science, as well as applied science,” Sid Pathak, assistant professor in the chemical and materials engineering department and team leader of the proposal-team, said. “This will give us more information on the structure of material, allow us to fabricate thinner samples and much higher image resolution.”

Pathak is one of several researchers who has projects that will use the dual, ion-beam microscope. Others are Mario Alpuche in the biology department, Bin Li in the chemical and materials department, and Andrew Geraci in the physics department.

Projects slated for the new scope include research on structures of galvanized, high-strength steels for automotive applications; studies at the atomic scale of glassy metals to better understand atomic arrangements or clusters; probing nanoscale damage gradients in irradiated materials, measuring non-Newtonian gravity behavior at the nanoscale with devices built using the microscope; studying laser generated strain rates of nanomaterials; and investigation of nanostructured catalytic materials for transformation of biomass to biofuel.

It will also attract new research. The microscope is essential for the research cluster for advanced manufacturing at the university, which was recently established in response to the resurgence of manufacturing at the state and national level. Applications of the focused ion-beam microscope to the ongoing research in materials science, physics, chemistry and other disciplines is expected to result in new advances and breakthroughs along these fronts.

It will advance multidisciplinary research programs in science and engineering, ranging from structural engineering materials, energy and functional materials to nanostructured materials and devices and fundamental physics.

The ion-beam microscope was funded with a 70/30 cost-share grant from the National Science Foundation, which awarded the

university \$640,000.

Mike Wolterbeek works for UNR.