Postdoctoral Research Associate in Radiation Effects and Advanced Electron Microscopy

The Department of Mechanical and Materials Engineering (MME) at Queen's University, Canada, invites applications for two full-time Postdoctoral Research Associate positions to join the Canada Excellence Research Chair (CERC) program in *Impact of Radiation in Energy and Advanced Technologies*, led by Prof. Yanwen Zhang. Interested applicants should contact Prof. Zhang directly at yanwen.zhang@queensu.ca with a cover letter, CV, and names of two referees.

Project Opportunity

Nuclear energy provides over half of Ontario's electricity and close to 13% of Canada's total electricity demand, making it the country's second-largest source of non-emitting electricity. As the demand for clean energy grows, improving the performance and durability of nuclear materials is critical. However, conventional alloy development and traditional materials science approaches remain insufficient for addressing the challenges posed by extreme reactor environments. Fundamental mechanisms governing materials performance under irradiation are not fully understood, limiting the design of next-generation materials for safer, longer-lasting reactors.

The RE-MAT (Radiation Effects in Materials and Advanced Technologies) team within the CERC program adopts a multidisciplinary approach combining experimental and computational methods. Focused on concentrated solid-solution alloys, conventional dilute alloys, and complex ceramic materials, this research aims to develop radiation-resistant materials with enhanced structural stability and deformation tolerance under high temperature, stress, and radiation environments. Collaborative efforts with academic institutions, national laboratories, and industry partners aim to accelerate materials innovation for nuclear energy systems, contributing to Canada's low-carbon future.

Role Description:

The successful candidates will conduct microstructural characterization and advance the understanding of the formation and evolution of radiation-induced defects, defect clusters, dislocations, and elemental segregation in structural and functional materials. Collaboration with both experimentalists and theorists, as well as active participation in enhancing the research activities of the Reactor Materials Testing Laboratory (RMTL), are key components of this role. Significant opportunities are available for scientific publications and collaborative experimental–modeling research.

Duties/Responsibilities:

- Apply advanced electron microscopy and materials characterization techniques to study radiation effects in complex alloys and ceramics.
- Use high-resolution Transmission Electron Microscopy (TEM) and Scanning TEM (STEM), including HAADF-STEM, to characterize atomic-scale defects and elemental distributions.
- Employ Energy Dispersive X-ray Spectroscopy (EDS/EDX) and Electron Energy Loss Spectroscopy (EELS) for nanoscale elemental analysis and chemical bonding assessment.
- Utilize Selected Area Electron Diffraction (SAED) to assess phase stability and lattice distortions caused by radiation damage.
- Perform site-specific sample preparation using Focused Ion Beam (FIB) techniques; experience with Atom Probe Tomography (APT) is advantageous for 3D compositional mapping.
- Analyze and correlate microscopy results to underlying radiation damage processes and mechanisms.
- Work with other team members to maintain a high level of scientific productivity. Present and report research results and publish scientific results in peer-reviewed journals in a timely manner.

- Ensure compliance with health, safety, and quality requirements.

Qualifications:

- PhD in Materials Science and Engineering or a closely related field with several years of relevant research experience in advanced microscopy and materials characterization skills; must have completed all degree requirements before starting the appointment and be within 4 years of receiving the Doctorate degree.
- In-depth knowledge and a minimum of three years of demonstrated experience in radiation effects research in metal alloys and/or ceramics.
- Strong record of productive and creative research demonstrated by publications, both as a lead author and a contributor.
- Excellent organizational, planning, and time management skills, with adaptability and flexibility. Able to anticipate deadlines, prioritize activities and tasks, and independently set priorities to accomplish multiple tasks within required timeframes.
- Motivated and safety-conscious, with excellent interpersonal, written, and oral communication skills in English for engaging with an international scientific audience.

Application Process

Please submit a cover letter, CV (including full publication list), and contact information for two referees to Prof. Yanwen Zhang at yanwen.zhang@queensu.ca. Applications will be reviewed on a rolling basis until the positions are filled.