**POSITION SUMMARY**

**QUEEN’S UNIVERSITY – Postdoctoral Researcher**

We are looking for an enthusiastic candidate for postdoctoral position(s) in radiation effects and microstructure characterization of complex alloys and ceramics. This position will be part of the recently $8M funded *Impact of Radiation in Energy and Advanced Technologies* CANADA EXCELLENCE RESEARCH CHAIRS (CERC) program.

Current and future energy technologies place pressing demands on materials performance under extreme conditions. The CERC activities focus on the bottom-up science-guided and top-down experience-informed design of structural materials for nuclear reactor systems. While traditional material development has progressively led to better performance of some dilute alloys and conventional ceramics, the lack of understanding of fundamental mechanisms hinders the design of better materials for longer-lived and safer nuclear reactors. In contrast to traditional ‘trial-and-error’ approaches, recent breakthroughs in concentrated alloys and high-entropy ceramics have vastly expanded the compositional space and allow elemental-specific tunability for advanced materials by design. Realistic prediction of materials' radiation responses and degradation mechanisms require understanding the coupled electronic and atomic dynamics. We will investigate equilibrium and non-equilibrium processes in both model complex materials, including high-entropy materials, and well-tested traditional alloys and compounds. This research focuses on the electronic and atomic levels, extending up to bulk materials with properties relevant to nuclear reactor structural applications. The broad goal is to understand deformation tolerance and structural stability of materials under far-from-equilibrium conditions, enabling the rapid development and nuclear qualification of materials to meet the growing demands for safe and economical performance in harsh and aggressive in-service environments. The CERC activities collaborate with academia, national labs, and the nuclear industry to ensure efficient knowledge mobilization and effective application across various fields and sectors of society.

The incumbent will work closely with the CERC, Prof. Yanwen Zhang to conduct research activities. The activities also include collaboration with other experimentalists and theorists in the Nuclear Materials Group, enhancing and expanding the experimental techniques at the Reactor Materials Testing Laboratory (RMTL). Working with the PI and a multi-disciplinary team of graduate students, Post-Doctoral Fellows, senior researchers, and visitors to RMTL, the incumbent will have significant opportunities for joint experiment-modeling-theory efforts and publications. This position is part of the Nuclear Materials Group within the Department of Mechanical and Materials Engineering (MME) at Queen’s University.

**Duties/Responsibilities:**

* Conduct studies of defects, defect processes, and radiation effects in complex materials in a radiation environment.
* Carry out microstructure characterization in ion-induced novel metal alloys and ceramics using a 4 MV tandem accelerator and advanced materials characterization facilities.
* Design experimental plans, prepare samples, and conduct research to understand defect formation, damage accumulation, short-range disorder, and various ion irradiation effects in materials.
* Responsible for presenting and reporting research results and publishing scientific results in peer-reviewed journals in a timely manner.
* Self-motivated and working with other team members to maintain a high level of scientific productivity.
* Ensure compliance with environment, safety, health and quality program requirements.
* Maintain strong commitment to the implementation and perpetuation of values and ethics.

**QUALIFICATIONS:**

* PhD in Materials Science and Engineering or a closely related field with several years of relevant research experience; must have completed all degree requirements before starting the appointment.
* In-depth knowledge and a minimum of three years of demonstrated experience in radiation effects research in metal alloys and/or ceramics.
* Experience in advanced materials characterization and analysis techniques of complex metal alloys and ceramics performance under extreme conditions. For example, proficiency in high-resolution Transmission Electron Microscopy to achieve detailed insights into material structures at the atomic level.
* Strong record of productive and creative research demonstrated by publications, both as a lead author and a contributor, in peer-reviewed journals and presentations at scientific conferences.
* 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 limited timeframes.
* Capable of innovative, independent research with the ability to work collaboratively in a team environment and interact effectively with a broad range of colleagues, both within and outside RMTL and MME.
* Motivated and safety-conscious, with excellent interpersonal, written, and oral communication skills in English for engaging with an international scientific audience.