Our communal goal of clean and sustainable energy could be met by progress in nuclear fusion technology. Depending on this is the development of improved fusion reactor shielding materials. Such materials are particularly critical for the promising spherical tokamak reactor, which is restricted in its space for neutron shielding. A class of advanced materials yielding increased attention are ceramic composites based on the carbides and borides of tungsten [1]. These materials have impressive properties compared to conventional candidate shields [2]. For example, they can be engineered to have high fracture toughness and good manufacturability due to the presence of a small volume fraction of ductile metallic binder. The binder also affords the ability to engineer oxidation resistant coatings, giving the materials impressive safety performance in accident scenarios [3].

Our lab is committed to the development of these materials for fusion power applications [1-3]. We work particularly on understanding the degradation mechanisms of these materials in extreme fusion reactor environments, including severe thermal and mechanical stresses, corrosion and irradiation. The ultimate goal of our work is to inform fusion reactor design and allow the development of materials with enhanced damage-tolerance. These aims are both critical in the eventual deployment of fusion power.

There is a vacancy in our team for an experimentalist in materials development, irradiation and mechanical properties. The applicant should have a background in materials science or show strong enthusiasm for learning the discipline. They should support collaboration in a team environment. Their project may consist of fabricating novel materials using powder processing techniques; irradiation experiments at national ion-beam irradiation facilities; and characterisation of irradiated samples. Such characterisation may include state-of-the-art micro-mechanical testing methods and electron microscopy.

The successful applicant will benefit from support by Tokamak Energy Ltd, a rapidly growing “technology pioneer” a in fusion engineering. They will also benefit from interacting with a vibrant community of researchers and world-class facilities provided by the Centre for Advanced Structural Ceramics and the Centre for Nuclear Engineering.

References:

a awarded by the World Economic Forum in 2015