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First results from a new tritium capable ion implantation materials facility.

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A new tritium facility to study the interaction of tritium with fusion relevant materials, and its retention and release, has been produced. Tritium retention is a major issue for fusion power devices. The new facility allows implanting of a range of gases into samples, including tritium. This facility is currently used for the UKAEA led Tritium retention in Controlled and Evolving Microstructure (TriCEM) project, which includes modelling work investigating the interaction of hydrogen isotopes with different types of microstructural damage, validated by experiments. The experimental section includes sample production, irradiation, implantation with deuterium or tritium, and characterization. Self-ion bombardment with energies of several MeV is used to mimic the defects created by neutrons in fusion power plant and the created traps are then filled with D/T in the new facility. The samples are analysed primarily using Thermal Desorption Spectroscopy (TDS) and Secondary Ion Mass Spectroscopy (SIMS). Part of the characterization and analysis work is carried out at the new Materials Research Facility (MRF). There is a noted lack of tritium retention experiments that this new tritium facility will make up for. Accurate study of isotope effects, such as the isotopic exchange in damaged microstructure, has previously been difficult due to a background signal of light hydrogen. This new capability will allow virtually background free measurements using tritium and deuterium. The design and build of this facility is described. Commissioning results are presented along with the first results from materials with controlled damaged microstructure.

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