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# Deuterium Desorption from Irradiated Tungsten Studied by In-situ Temperature Dependent Positron Annihilation Spectroscopy

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The materials in a nuclear fusion reactor will face extreme conditions of particle bombardment and power load. Tungsten is widely considered the only appropriate material for plasma facing components due to its high melting temperature, good thermal conductivity and low sputter yield. The interaction of ionizing radiation with tungsten will lead to atomic displacements and thus to the formation of lattice defects. The loading of these defects with deuterium, tritium and helium affects mechanical properties and thermal conductivity which are key to the successful operation of a fusion reactor. Furthermore, the extent to which foreign atoms are trapped at defects in tungsten will directly affect the tritium budget of a fusion reactor.

We present an in-situ, temperature dependent, investigation of deuterium desorption from self-ion irradiated tungsten. Positron Annihilation Lifetime Spectroscopy (PALS) allows the measurement of vacancy type defects down to single vacancies as well as the loading of these defects with deuterium. Tungsten samples, which have been irradiated with self-ions and then deuterium loaded, are heated during PALS measurements. Spectra composed of the characteristic lifetimes of different defect types allow identification of the specific trapping locations from which deuterium is desorbed. These data will provide critical benchmarking for rate equation codes which are used to predict tritium transport under fusion reactor conditions.

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