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Molecular Dynamics Simulations of Interactions between Hydrogen and Fusion-relevant Materials

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Fusion promises clean energy on a large scale for the 21st century. In a fusion reactor energy is released by fusing hydrogen nuclei to helium. The temperature of the hydrogen plasma is 150 million degrees and it is confined in a magnetic field preventing contact with the reactor walls with one exception: the part of the wall called divertor. At the divertor the fusion product helium is removed from the plasma and wall contact cannot be avoided.

The interactions between the hot hydrogen plasma and the candidate divertor materials, carbon and tungsten, were simulated with molecular dynamics.

The studied topics include the dependence of the carbon erosion on the hydrogen flux, the sticking probability of eroded hydrocarbons on carbon surfaces that were previously bombarded with different hydrogen fluxes and the behaviour of tungsten carbide under deuterium bombardment.