Deuterium retention in reduced activation ferritic/martenitic steels (RAFMS) at ELM-like pulse plasma heat loads

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The reduced activation ferritic-martencitic steels (RAFMS) are promising structural materials for fusion. Some authors also propose to use RAFMS as plasma-facing materials in areas with relatively low plasma and heat loadings. In the present work the 2 mm thick samples of Rusfer (EK-181) and Eurofer RAFMS were irradiated at QSPA-T facility by ELM-like pulse deuterium plasma. Two levels of heat loads on the samples were selected: 0.3 MJ/m^2 and 0.6 MJ/m^2. The pulse duration was ~1 ms, number of pulses was in a range of 1 and 5. At the plasma heat loading of 0.3 MJ/m^2 surface layers of RAFMS was not melted but cracks appeared at surfaces of both materials. The density of cracks at Eurofer surface is about twice lower. After loading with 0.6 MJ/m^2 the surface of Rusfer samples is waved. Deuterium retention in RAFMS after plasma irradiation was investigated by thermodesorption measurements. If surface layer melts (at loading with 0.6 MJ/m^2) deuterium retention in RAFMS is several times higher than at loading below melting threshold (0.3 MJ/m^2). The maximum amount of deuterium retained in RAFMS samples was 10^{21} D/m^2.

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