SELECTIVE SPATTERING OF LOW-ACTIVATION FERRITIC – MARTENCITIC STEEL EK-181 (RUSFER) [[1]](#footnote-1)\*)

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Ferritic-martensitic steels with a fast reduce of neutron-induced activity (reduced activation ferrite-martensitic steels, RAFMS) are promising structural materials for nuclear, fusion and hybrid reactors. The possibility of their application as plasma-facing materials is also considered [1]. The basis of RAFMS is iron. These steels also contain 8-12 wt. % Cr and 1-2 wt. % W. The other elements concentrations are much lower. If the energy of ion irradiating the RAFMS is sufficient to sputter atoms of Fe and Cr, but not sufficient to sputter tungsten atoms, selective sputtering takes place. It is assumed that the surface layer enriched with tungsten can protect the material from further sputtering.

In this work, samples of Russian RAFMS EK-181 (Rusfer) were irradiated with deuterium plasma with an energy of 100 eV/ion. The fluence was in a range of 1024÷1026 D /m2 at a flux of 3⋅1021 D/m2c and temperatures of 350÷650 K. The sputtering coefficient was determined by the mass loss of the sample. At a fixed temperature the sputtering coefficient decreases with increasing radiation dose. At a fixed radiation dose, the sputtering coefficient increases with increasing temperature. At spattering elongated structures are formed on the surface. The height of these structures increases with increasing fluence. Energy-dispersive x-ray spectroscopy shows the enrichment of these structures with tungsten. According to the results of Rutherford backscattering spectroscopy, the concentration of tungsten on the surface of Rusfer increases with increasing fluence and at a dose of 7⋅1025 D/m2 increases 10 times compared to the initial concentration, reaching 4÷6 at. %. The enrichment of the surface with tungsten is probably the reason for the decrease in the sputtering coefficient with increasing fluence.

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References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/Lt/ru/EY-Golubeva.docx) [↑](#footnote-ref-1)