

STUDY OF INTERACTION OF DEUTERIUM PLASMA WITH THE FIRST WALL IN GLOBUS-M TOKAMAK BY NUCLEAR MICROANALYSIS TECHNIQUES

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Globus-M is the first Russian spherical tokamak built at A.F. Ioffe Physico-Technical Institute in 1999. It can operate with high deuterium plasma density up to 10^{20} m^{-3} and high specific power deposition in to the plasma volume up to a few MW/m^3 [1]. The analysis of wall material (steel and graphite tiles RGTi-91) to hold (collect) deuterium was made (Fig.). The element composition of the films deposited on the inner surface of vacuum chamber was studied by Rutherford back scattering technique and by nuclear reaction analysis.

The migration of the deuterium inside the steels and graphite tiles was studied. Results are presented in Table. Thickness and composition of the deposited layers are depended on the evolved power in different places of chamber.

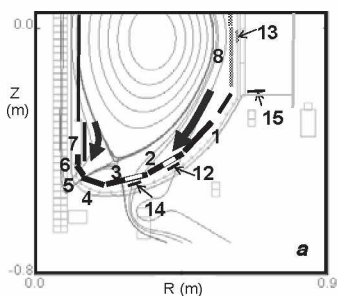


Fig. Cross section of the Globus-M lower part with deuterium plasma configuration. Number of investigation samples: 1-8 – graphite tiles; 12, 14 and 15 – steel samples.

Table. Partial thicknesses of deposits on the different samples (10^{16} at./cm^2)
(T -total thickness, one Ti and C, at/cm^2)

Samples	D	B	C	Si	Cr	Fe	Ni	Cu	W	T
1	36	83		6	17	44	5	1	4	$160 \cdot 10^{16}$
2	56	63		1	30	75	9	3	6	$187 \cdot 10^{16}$
3	79	660		0	45	112	13	3	7	$926 \cdot 10^{16}$
4	82	650		2	53	139	18	7	6	$875 \cdot 10^{16}$
5	100	200		8	39	102	13	4	2	$368 \cdot 10^{16}$
6	120	94		0	45	120	15	5	7	$286 \cdot 10^{16}$
7	~ 0.01	1		4	4	14	2	1	0	$26 \cdot 10^{16}$
8	~ 0.01	0		2	2	7	0,3	0	0	$11 \cdot 10^{16}$
12	32	5.4	90	—	—	—	—	—	—	—
14	31	15	80	—	—	—	—	—	—	—
15	19	16	28	—	—	—	—	—	—	—