The interaction of H_2O with strained uranium metal surfaces

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The interaction of water vapor was studied on uranium metal surfaces, with various degrees of strain (relieved by different degrees of heating) [1]. The main features of dissociation, adsorption and initial oxidation for the studied surfaces will be presented. Common to all strained surfaces, on the metal surface a full dissociation occurs, while after oxidation only on most of them the water dissociation is full and on one of them, it is only partial. The oxygen dissociation product adsorbs (with sticking coefficient decreasing with strain relief), forming clusters, for all strains, while the hydrogen product clusters only on the strain relieved and recrystallized surface. The most interesting phenomenon, revealed for these surfaces, is the inhibition of hydrogen adsorption by traces of water vapor [2], changing from 10% for the mostly strained (defected) surface down to 1% for the strain relieved one. The suggested mechanism for this inhibition will be discussed.

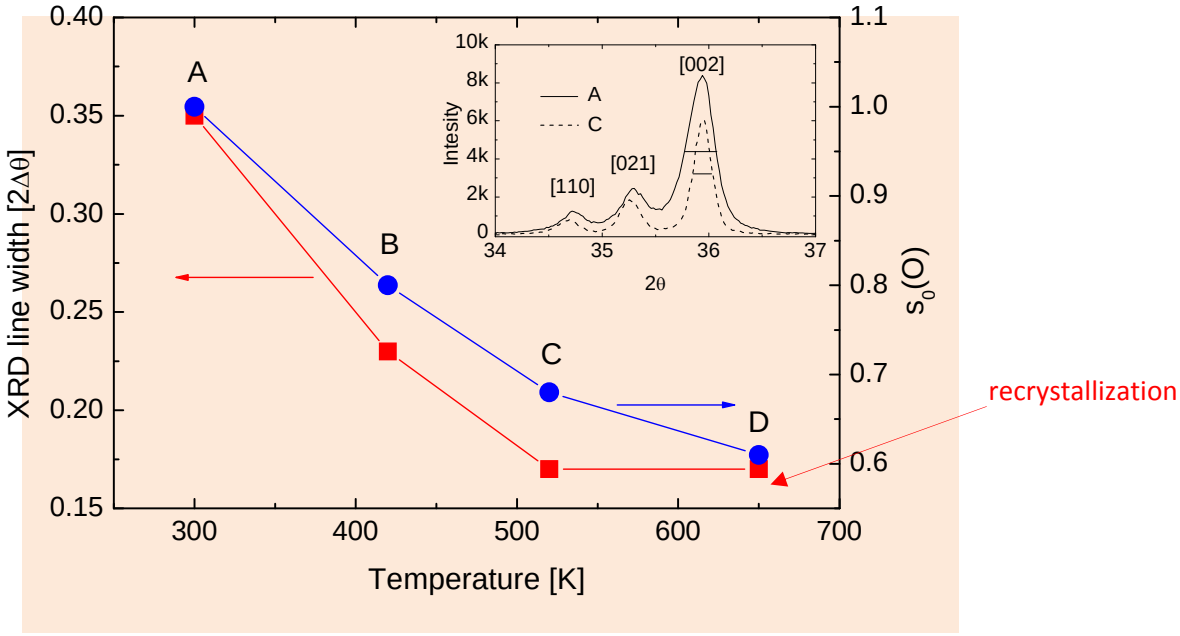

Fig. 1: The correlation between strain relief (heating temperature) and oxygen (product of water dissociation) sticking coefficient.

Table 1: Summary of results for the interaction of H_2O with strained uranium surfaces:

sample	Heating to, for 48+ h	Water dissociation		Clustering for H_2O adsorption		AES pressure depend-ence		Hydrogen adsorption inhibited by H_2O	Oxidation by H_2O - addition Of 1‰ O_2
		metal	oxide	O (s_0)	H (s_0)	H_2O	O_2	DRS	AES
A	No heating	Full	Full	Y (1)	N(0.5)	No	No	Yes (10%)	Enhance-ment
B	420 K	Full	Partial	Y(.80)	N (0.4)	Yes		Yes (1%)	No inhibition
C	520 K	Full	Full	Y(.68)	N (0.4)	No		Yes (2%)	No inhibition
D	~650 K	Full	Full	Y(.68)	Y(.17)	No		Yes (1‰)	No inhibition

References

[1] E. Tiferet, M.H. Mintz, S. Zalkind, I. Jacob, N. Shamir, *J. Alloys Comp.* **444–445**, 177 (2007).

[2] E. Tiferet, M.H. Mintz, I. Jacob, N. Shamir, *Surf. Sci.* **601**, 4925 (2007).