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P4.211 OXIDATION BEHAVIOUR OF TUNGSTEN WITH VANADIUM ADDITIONS

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W-V alloys have already been considered for their use in the first wall armor components, but no information about their oxidation resistance is available. To guaranty passive safety of the future fusion reactors during a loss of coolant accident and the ingress of air in the fusion vessel, a full characterization of the oxidation behavior of new tungsten based materials is required. After a power shut-down, the heavily irradiated first wall components may reach temperatures of ≈1000 ºC due to neutron decay heat. At those temperatures, tungsten based components may form highly volatile radioactive oxides that could be released to the environment.
In the present study, the oxidation behavior of W-2V and W-4V (wt. %) alloys has been evaluated in air between 600 and 800˚C. Thermogravimetric curves prove that oxidation behavior of pure tungsten at 600˚C is drastically modified by vanadium additions. Mass gain for the W-2V is about 10 % lower than that of W-4V or pure tungsten. At higher temperatures, however, vanadium additions degrade the oxidation resistance of pure tungsten to catastrophic levels, being the negative effect more pronounced as the vanadium content in the alloy increases. Harmful influence of vanadium is maximum at 700˚C, temperature at which the oxidation rate of W-V alloys becomes, at least, four times faster than that found for pure tungsten while at 800˚C the difference is reduced about two times higher. The accelerated oxidation of W-V alloys is related to the evaporation of vanadium oxides in the course of the oxidation, leading to a porous scale which cannot confer any protection to the alloy.

Presenter: MONGE, Miguel Angel (Departamento de Metalurgia F'sica Centro Nacional de Investigaciones Metalˆrgicas)

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