Contribution ID: **536** Type: **not specified**

P4.201 W-Cr and W-Ti alloys consolidated by field assisted sintering with and without carbon diffusion barrier

Thursday, 20 September 2018 11:00 (2 hours)

Tungsten is a refractory metal with very good thermal properties i.e. high thermal conductivity, high melting point, good high-temperature fatigue strength etc. Therefore, tungsten is of great interest in thermonuclear fusion research, mainly acting as a heat sink and an erosion protection on the first wall panels. However, mechanical properties and oxidation resistance of tungsten are rather poor. This can be overcome by alloying of tungsten, which improves the oxidation properties. Field assisted sintering has proved to be a suitable technology for consolidation of tungsten alloys. Field assisted sintering is a method of powder materials compaction by applying pulsed electric current and high pressures. Powder is compacted in graphite die, usually with graphite foil used to prevent the adhesion. In comparison to conventional methods, fabrication is feasible in shorter times and at lower temperatures. Numerous studies performed on various materials have shown that, even at short sintering time and low temperature, significant carbon contamination occurs. Negative effect on the material properties e.g. mechanical or optical was reported. However, similar study on tungsten and tungsten alloys has not been performed yet, even though such contamination is undesirable as well.
In this study, samples with two different compositions, W-10%Cr-1%Hf and W-7%Ti-2%Hf (wt. %), were prepared by mechanical alloying and field assisted sintering using two different foils. Sintering using graphite foil has shown that carbon contamination is a serious issue for tungsten alloys. In attempt to lower the carbon contamination, sintering was performed using tungsten foil serving as a carbon diffusion barrier. It was found that response of each alloy on foil material is different, however both alloys exhibit significantly lower amount of carbides formed during sintering in tungsten foil.

Presenter: VEVERKA, Jakub (Institute of Plasma Physics of the Czech Academy of Sciences v.v.i.)

Session Classification: P4