27th IEEE Symposium on Fusion Engineering



Contribution ID: 408

Type: Poster

Boron Carbide Coating on Tungsten By ICP Thermal Spraying

Wednesday 7 June 2017 13:40 (2 hours)

Boron carbide was proved as a practicable material of in-situ protecting coating for tungsten tiles of Tokamak divertor, which is also expected to be presented towards the other plasma facing materials (PFM) in fusion device. In the work, B4C coating on tungsten substrates by means of inductively coupled plasma (ICP) thermal spraying technique is studied, which is driven by a 24-60 MHz RF power. Compared with arc plasma, ICP allows for considerable reduction of plasma contamination associated with electrode erosion. In order to investigate the effects of hydrogen introduced into sheath gas of ICP torch on B4C coatings fabrication, the characteristics of plasma at different Ar/H2 proportion are diagnosed by optical emission spectroscopy (OES), and the melting processes of B4C particle in plasma are studied. For improvement of coating binding force, we prepared B4C/W coatings by the method of functionally gradient materials (FGM), in which B4C/W spraying powder was fed into ICP torch with gradient ratio. The characterization of the coatings are presented with compositional (XPS), structural (XRD) and morphological (SEM) analyses. And the testing under high heat loads and thermal cycling, together with the bonding strength is described. All the plasma properties and the characterization results of B4C/W coatings would give us an insight of improving the B4C coatings fabrication process.

Eligible for student paper award?

Yes

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Session Classification: W.POS: Poster Session W

Track Classification: Materials and fabrication