THE DEVELOPMENT AND PROSPECT OF FABRICATION OF W BASED PLASMA FACING COMPONENT BY ATMOSPHERIC PLASMA SPRAYING

Z. Zhou[1], S. Guo[2], S. Song[1], W. Yao[1], C. Ge[1]

[1] *School of Materials Science and Engineering, University of Science and Technology Beijing, Beijing 100083, China*

[2] *School of Materials Science and Engineering, Southwest Jiaotong University, Chengdu 610031, China*

Corresponding author: zhouzhj@mater.ustb.edu.cn

For the near term application, a possible convenient solution for W based plasma facing component (especially for the first wall application) is the coating of the heat sink or structural materials with a thin tungsten layer by plasma spraying. For avoiding oxidation during plasma spraying, W is usually sprayed under controlled atmospheric conditions, i.e. vacuum or inert gas atmosphere.

In this work, the possibility and development of fabrication of thick W coating by atmospheric plasma spraying (APS) is summarized and reported. Through controlling the condition and parameters of the APS can reduce or even eliminate the oxidation of the tungsten coating. W coating with thickness of 2-3 mm and porosity less than 5 % can be fabricated by APS. The tungsten coatings with different initial particle sizes resulted in different microstructures. The effects of different interlayers of NiCrAl, NiAl and W/Cu on bonding strength were studied. SEM, EDS and XRD were used to investigate the photographs and compositions of these coatings. The tungsten coating deposited directly onto the copper substrate presented higher bonding strength than those with different interlayers, while the coating with a W-Cu (W50%, Cu50%) interlayer shows the best thermal shock resistance.