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VPS-W へのパルス熱負荷と He プラズマ同時照射によるアーキング

Arcing by pulse heat load and He plasma simultaneous irradiation on VPS-W

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1. Introduction

In the blanket of the nuclear fusion DEMO reactor, the use of layered materials of W (tungsten) and F82H (reduced activation ferritic/martensitic steel) is planned. For W, there are advantages such as a low erosion rate, a high melting point, and a high thermal conductivity as plasma facing materials, on the other hand, F82H can carry a role as structure body of the blankets. A method to thin coating of W on the surface of F82H using VPS (Vacuum Plasma Spray) technology is widely used. A study on VPS-W has been required to evaluate its feasibility for the use in DEMO reactors. In this study we simulated ELM (Edge Localized Mode) like heat loading effects on VPS-W by YAG laser pulse heat loads and He plasma simultaneous irradiation to observe the effects of the ELM like heat loads on VPS-W. From our preliminary experiments, it was found that arcing occured on VPS-W by the pulse heat load and He plasma simultaneous irradiation.

2. Experiment

All experiments were conducted at LaPlex (Laser and Plasma EXposure device).The heat load of ELM was applied by Nd-YAG pulse laser. The exposed energy fluence was changed up to 7.0 MJ/m^2 with effective pulse duration of 130μs (long pulse mode). The incident He flux was varied up to ~10^{21}/m^{2}s and the fluence up to ~10^{25}/m^2. After simultaneous irradiation, the specimen surface was observed by SEM (Scanning Electron Microscope).

3. Results

With simultaneous pulsed heat loading and He plasma irradiation, arcing were observed on the VPS-W surface. In previous study, arcing was also observed on pure W with fuzzy surfaces [1]. In this poster presentation, I will show the conditions to induce arcing on VPS-W.

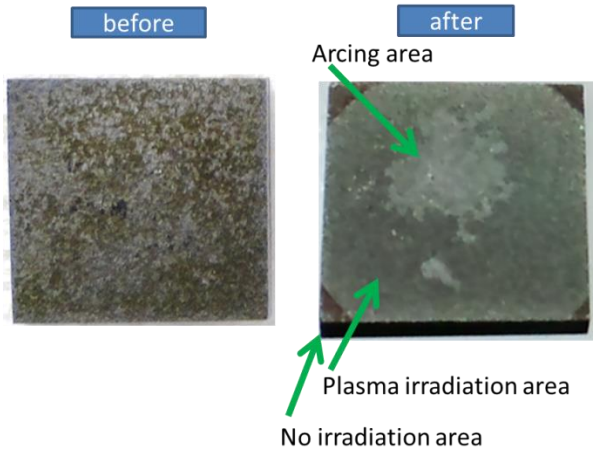

Fig. 1 Arcing observed on VPS-W

4. Reference

[1] Shin Kajita, Plasma Physics and Controlled Fusion 54(2012)035009(9pp).