3P65

磁場形状が過渡的熱負荷下でのタングステン溶融挙動に及ぼす影響

Effect of magnetic field configuration on motion of molten tungsten layer under transient heat loads

菊池雄大[1]、伊庭野健造[1]、本井大智[1]、斉藤晶[1]、リハンテ[1]、上田良夫[1]

Yudai Kikuchi[1], Kenzo Ibano[1], Daichi Motoi[1], Sho Saito[1], Heun Tae Lee[1], Yoshio Ueda[1]

[1]:大阪大学大学院工学研究科電気電子情報工学専攻

[1]: Graduate School of Engineering, Osaka University

1. Introduction

Tungsten (W) is the main candidate material for PFCs. The current problems are droplet release and PFC lifetime degradation due to melting of the divertor affected by a high heat flux loading during transient events.[1] Although a lot of studies on the W molten layer have been carried out, the melting behavior of the tungsten under a high magnetic field, similar to the ITER condition, has not been studied so far.

The purpose of this study is to observe the tungsten melting behavior under high magnetic fields close to ITER and to understand the effect of high magnetic field configuration on the melting behavior.

2. Experiment

Experiments were carried out in a vacuum chamber to which a maximum magnetic field of 5 T was applied. The high heat flux was obtained by a Nd:YAG pulsed laser with the maximum peak power density of 4 GWm^{-2} in a duration of ~5 ms. The laser irradiating position was changed perpendicular to the magnetic field. The irradiated spot was observed by a high-speed camera and a laser microscope.

3. Result

The irradiated spot and the surface profile were observed by post-mortem analyses (Fig.1). A difference in height is observed at the molten layer at both edges in the direction along the magnetic field. This shows the molten layer moved in the direction along the magnetic field during the laser irradiation by an electromagnetic force.

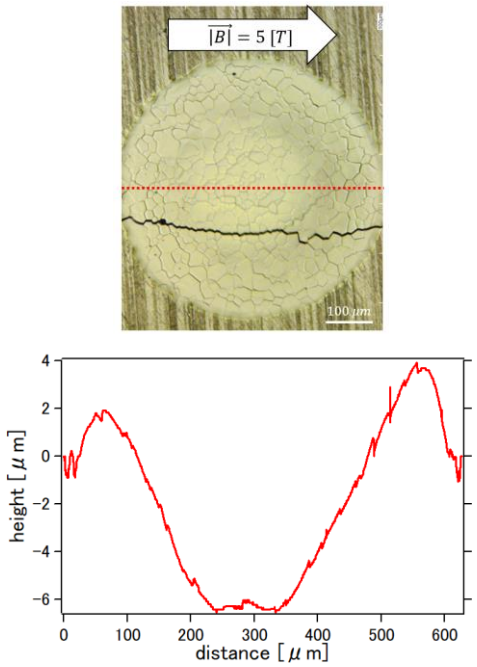

Fig1: the irradiated spot(Top) and the surface profile along the red line(Bottom)

Reference

[1]: J.W.Coenen at al. Journal of Nuclear Materials 415(2011) S78-S82