

アニーリングによるバンドル状繊維構造周辺のファズの局所的な消失 Localized disappearance of fuzz around NTB after annealing

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1. Introduction

The process exhausting helium ash out of the fusion reactor is called edge localized modes (ELMs), which is accompanied by high energetic plasma (about 1 GW/m²) [1]. When this heat load reaches nano-tendrils bundles (NTB), which is known to be formed on tungsten by helium plasma exposure with additional impurity gas [2], arcing will be triggered. So it is important to research the thermal response of NTB when ELMs occurs. When performing annealing experiment to NTB sample, fuzz was found to have disappeared locally around NTB [3], as shown in Fig. 1. This research investigates this phenomenon including the mechanism.



Fig. 1 Localized disappearance of fuzz around NTB

2. Experiment

A thin W substrate was exposed in helium plasma with impurity neon gas in NAGDIS-II. After the plasma exposure, NTBs and fuzz were formed on the surface. Then the NTB and fuzz sample was annealed in TDS at different temperature and for different time period.

Scanning electron microscope (SEM) and other observation methods were used to observe the morphological changes caused by

annealing experiment of NTB samples and also to verify if the localized disappearance of fuzz is due to nonuniformity thickness of fuzz.

To research the thermal response of NTB and verify the possibility of temperature difference around NTB, NTB was simulated as a cone with a height of 20 μm and a radius of 20 μm situated on W substrate in the cylindrical coordinate system. Fig. 2 shows the temperature distribution of NTB sample during annealing. The result confirmed the higher temperature of NTB, which may be the cause of the phenomenon of localized disappearance of fuzz around NTB.

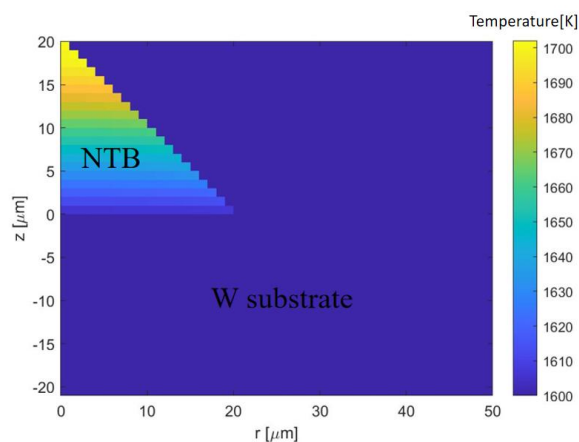


Fig. 2 Temperature distribution on NTB sample

References

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