

炭素材への重水素・窒素混合ビームによる化学スパッタリングの研究

The research of chemical sputtering by mixture beam irradiation of deuterium and nitrogen on carbon material

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1. Introduction

Nitrogen is considered a candidate impurity species to achieve a radiatively cooled divertor in ITER to reduce the heat loads on plasma facing materials. Carbon is planned for use as plasma facing material in the strike point region. However nitrogen chemically erodes and sputters carbon. The chemical erosion under simultaneous impact by nitrogen and hydrogen isotope species are not well known. This study examines the change in carbon erosion due to deuterium and nitrogen irradiation as function of nitrogen percent and sample temperature.

2. Experiment

The samples used were pure carbons measuring $10 \times 10 \times 1$ mm that were lapped and polished to a roughness of less than $0.75 \mu\text{m}$. The C specimens were irradiated using the HiFIT irradiation device at Osaka University. The experimental parameters varied were the N% in the ion beam (2, 5, 10%) and sample temperature (573 – 973 K). The implanted fluence was kept constant at

$1 \times 10^{24} \text{ D/m}^2$. The acceleration voltage was fixed at 300 eV. The method measuring erosion of carbons was obtained to measure the difference of the mass of carbons between before and after experiments.. These experiments were compared to D-only experiments.

3. Results and Discussion

In this presentation, we present data on C erosion by mixed D+N with the aim of clearly showing the following points:

- i) Difference in C erosion due to N impurities by comparing mixed D+N experiments with D-only.
- ii) The C erosion dependence on sample temperature.
- iii) The C erosion dependence on N % in the ion beam.