

§42. High Heat Load Experiments for Bulk Boronized Graphite and SiC Converted CFC

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The bulk boronized graphites with different boron concentrations and SiC converted CFC were irradiated by an electron beam with a heat flux ranging from 2 to 6 MW/m<sup>2</sup> for a time period up to 120 s in ACT of NIFS[1].

The surface temperature was observed to be as high as 2600 °C. The evaporation amount of boron, silicon or carbon was measured by a weight loss method. The depth composition profile and surface morphology before and after the irradiation were also examined by AES and SEM, respectively.

The boron content of the bulk boronized graphite such as GB-110 or GB-120 largely evaporated at the temperature higher than about 1700 °C, as shown in Fig.1. The evaporation rate of the boron was observed to rapidly increase both with boron concentration and surface temperature(Fig.2).

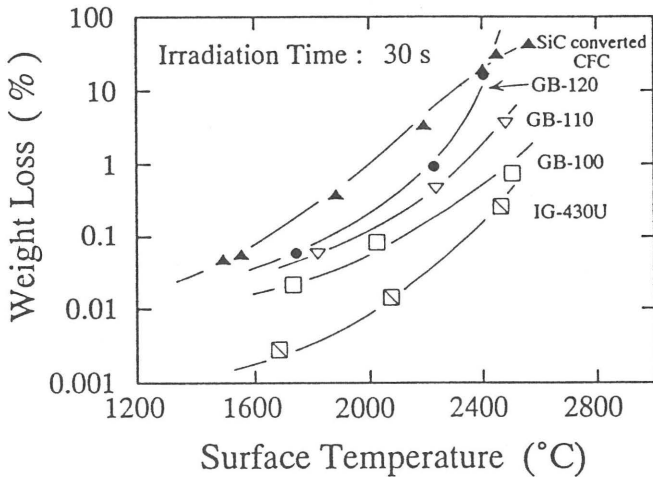


Fig.1. Weight losses of bulk boronized graphites (GB-110, GB-120), SiC converted CFC and graphites (IG-430U, GB-100), versus surface temperature.

For the SiC converted graphite, the silicon largely evaporated at the temperature higher than 1500-1600 °C(Fig.1). In both materials, the evaporation of carbon took place at the temperature above 1500-1600 °C.

The boron or silicon content in the depth direction after the irradiation was quantitatively evaluated. In addition, the surface morphology after the irradiation for the bulk boronized graphite showed the structure of carbon flakes, and for the SiC converted graphite the carbon fibers without SiC coatings and the surface without SiC crystal particles.

The present results show that these materials have to be employed in the environment with relatively low temperature, less than 1500-1700 °C.

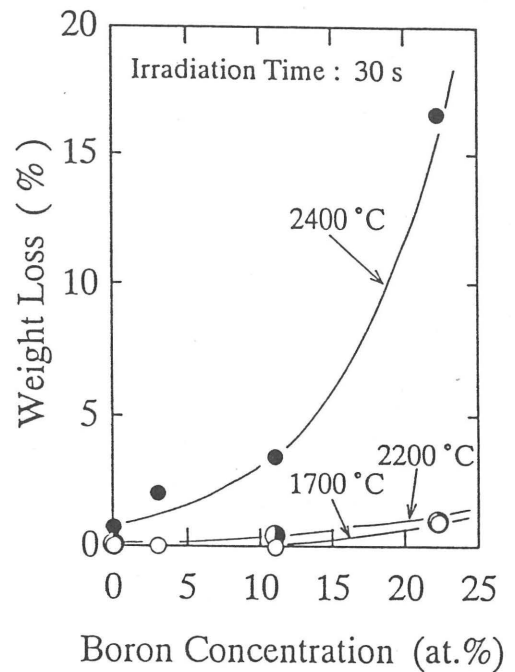


Fig.2. Weight loss of bulk boronized graphite versus boron concentration.

References

- 1)Fujita, I., Hino, T., Yamashina, T. et al, Proceedings of 11th PSI Conference, P.152, Mito, May 1994.