

## §9. Cooling Performance of a Forced Gas-cooled Brewster Window

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Cooling performance of the gas-cooled Brewster window was studied [1]. The disk (Kyocera SN-287, 120x320mm<sup>2</sup>, 2.53mm-thick) was heated by dielectric loss due to microwave transmission and also by a dummy heat source. In the latter case, a film resistor (0.12mm-thick, 90mmx300mm) was pressed to the disk surface (vacuum side) and DC currents of ~120A were induced. Temperature distribution on the disk surface (atmospheric side) was measured with an IR camera.

Figure 1 shows two cooling-gas (dried air) ejecting methods. The gas is ejected onto the disk surface from 9 1mm-diam. holes which are distributed along (a) the straight manifold mounted on the disk-supporting flange and (b) the edge of the circular waveguide (atmospheric-side). The circumference of the disk is water-cooled.

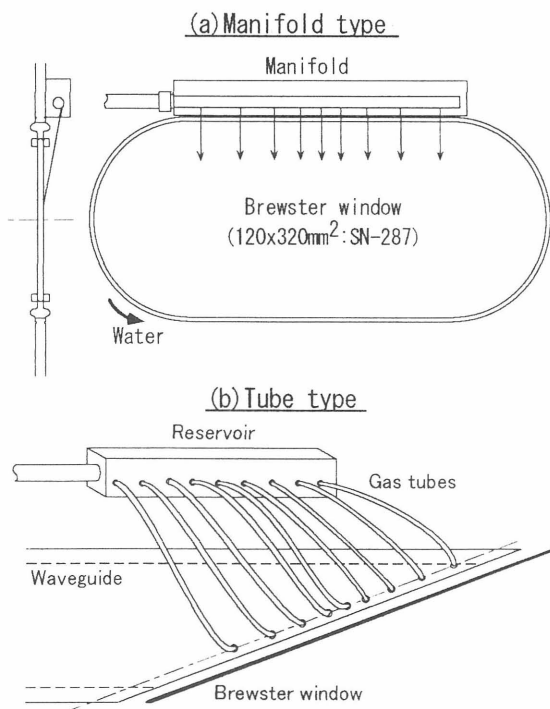


Fig.1 Cooling-gas ejection systems.

Figure 2 shows temperature distributions along the major axis at the dummy heating power of 300W (type a gas ejection). The disk (particularly central part) is effectively cooled down by gas cooling. This is because the gas-nozzles are concentrated around the central part. The water-cooling is also effective, indicating high thermal conductivity of the present silicon nitride disk.

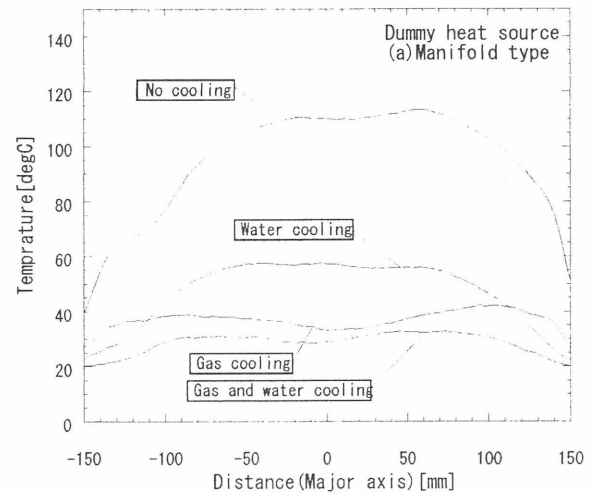


Fig.2 Temperature distributions along the major axis (dummy heat source power=300W).

Figure 3 shows temperature distributions after the 30sec transmission of 58kW microwave (type a gas ejection). The distribution before cooling indicates that the incident microwave power has a fairly peaked profile. This is supposed from the fact that the water-cooling is not so effective as in the dummy heat source experiment (heating power distribution is flat). The profile also shows non-symmetry in the major axis direction. The temperatures at Z=+150mm and Z=-150mm should be equal to each other and close to that of cooling water (the cooling pipe is located at Z=±160mm). The reason is not understood yet.

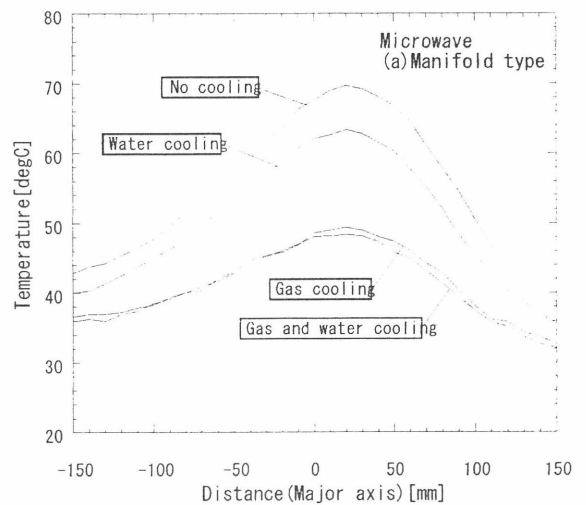


Fig.3. Temperature distributions along the major axis (microwave power=58kW, t=30sec). Flow rates of gas and water are 180l/min and 2l/min, respectively.

### Reference

- 1) Shimozuma, T., Ito, S., Takita, Y., Sato, M., Kubo, S., Idei, H., Ohkubo, K., Shirasaka, M., Morimoto, S., this annual report.