BONDING TEST OF BERYLLIDES BY PLASMA SINTERING METHOD

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Advanced neutron multipliers with lower swelling and higher stability at high temperature are desired in pebble bed blankets, which will give big impact on the DEMO design such as the blanket operating temperature. Development of advanced neutron multiplier has been started between Japan and the EU in the DEMO R&D of the International Fusion Energy Research Centre (IFERC) project as a part of the Broader Approach activities from 2007 to 2016.

Beryllium intermetallic compounds (beryllides) such as $Be_{12}Ti$, $Be_{12}V$, etc. are the most promising advanced neutron multipliers. However, beryllides are too brittle to produce pebbles. The establishment of the fabrication technique for beryllides is a key issue of the advanced neutron multiplier development.

In the previous study, it was clear that the intermetallic compound beryllides of Be-Ti can be directly synthesized by the plasma sintering method form mixed elemental powders of Be and Ti at a temperature lower than the melting point. Beryllides in the shape of a rod are necessary to fabricate the beryllides pebbles as raw material. In this study, it reports on the preliminary results of bonding test of beryllides using this plasma sintering method for development of beryllides rod fabrication technique.

Bonding test was carried out using beryllides disks made by the plasma sintering method. Two plasma sintered disks were jointed by the plasma sintering at 1273 K for 20 min under 50 MPa pressure (see Fig.1). This condition is the same as beryllides disk fabrication. Structure observation and hardness measurement were performed. There is no joint interface or boundary line in the joint sample. Structure between joint interface and bulk regions is same structure. Hardness between joint interface and bulk material were almost the same (see Fig.2). It was clear that the beryllides could be directly synthesized and jointed by the plasma sintering method.

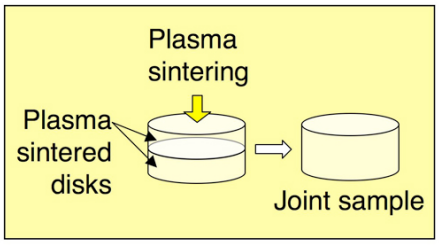

Figure 1: Schematic of beryllides joint

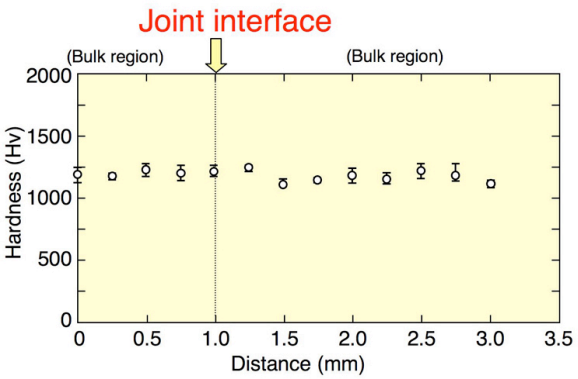

Figure 2: Hardness distribution of beryllides joint sample