JAPANESE CONTRIBUTION TO THE DEMO-R&D PROGRAM UNDER THE BROADER APPROACH ACTIVITIES

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Several technical R&D activities related to the blanket materials are newly launched as a part of the Broader Approach (BA) activities, which was initiated by the EU and Japan, and is aimed at DEMO. According to the common interests of these parties in DEMO, R&Ds on reduced activation ferritic/martensitic (RAFM) steels as structural material, SiC_f/SiC composites as a flow channel insert material and/or alternative structural material, advanced tritium breeders and neutron multipliers, and tritium technology are carried out through the BA DEMO R&D program [1], in order to establish the technical bases on the structural and functional materials required for DEMO blanket design. This paper describes the Japanese contribution to those R&D activities.

As part of the RAFM steel mass production development, a 5-ton heat of RAFM steel (F82H-BA07) was procured by Electro Slag Re-melting as the secondary melting method. Characteristics of F82H-BA07 heat such as tensile and Charpy impact properties were examined. Dispersion of tensile property obtained with small size tensile specimen was evaluated on 15 and 45mm thick plates and 60% cold-worked (CW) plate. No size effect but shape effect was observed in fatigue life evaluation for F82H.

For the SiCf/SiC composites development, NITE- and CVI-SiCf/SiC composites were prepared as reference materials and preliminarily mechanical and physical properties were measured. The failure behavior of SiC/SiC composites by various failure modes was investigated.

Beryllium intermetallic compounds (beryllides) such as $Be_{12}Ti$ and $Be_{12}V$, etc. are the most promising advanced neutron multipliers. To study the fabrication method of beryllide, a series of preliminary tests has been carried out. It was presumed that the Be-Ti compounds could directly be synthesized by the plasma sintering method from mixed powder particles of Be and Ti, even in the case where the temperature of materials was lower than their melting points. It was also confirmed that the compounds could be granulated by the infrared melting method. To study the pebble fabrication methods of the breeder materials, a series of preliminary tests were also carried out for Li_2TiO_3. It was confirmed that the pebbles of Li_2TiO_3 having the sphericity of 1.04 could be prepared by the rotating granulation method.

New multipurpose RI facility has been prepared as a main activity of the tritium technology R&D at Rokkasho BA site. Also preliminary tests of the tritium behavior on the blanket materials have been carried out at present JAEA facilities and otheres.

[1] T. Nishitani et al., J. Nucl. Mater., 386-388 (2009) 405-410.