

FABRICATION AND HIGH HEAT FLUX TEST OF LARGE MOCKUPS FOR ITER

FIRST WALL SEMI-PROTOTYPE

Suk-Kwon Kim, Dong Won Lee, Young-Dug Bae, Hyun-Kyu Jung, Yang-Il Jung,

Jeong-Yong Park, Yong-Hwan Jeong

Korea Atomic Energy Research Institute, Daejeon, 305-353, Korea

Corresponding author: skkim93@kaeri.re.kr

The main topic of ITER first wall procurement is to qualify that each party have the key technology for the fabrication and joining of first wall components. The semi-prototype qualification project will be released such that single components of full-scale first wall must be fabricated and successfully passing the high heat flux tests up to 5 MW/m² with hypervapotron cooling channel. In this work, the various type mockups have been modeled and fabricated to develop the joining technology for semi-prototype (710 mm x 305 mm), which are 710 mm x 100 mm, 350 mm x 100 mm large mockups, 80 mm x 80 mm standard mockups (Korean). The semi-prototype which has three double-fingered panels is scale-down component of full size first wall. The standard mockups with 80 cm x 80 cm beryllium tile which joined to CuCrZr heat sink were fabricated to qualify our HIP (Hot Isostatic Pressing) technology. These standard mockups were installed to perform the high heat flux test in the Korea heat flux test facility (KoHLT-1) [1] with the surface heat flux of 1.25 MW/m². The fabrication procedure of the standard mockups is consisted of the joining of CuCrZr intermediate with stainless steel base and Be tile with this heat sink [2]. For the CuCrZr and stainless steel, HIP was conducted at 1050 °C and 100 MPa for 2 hours. During the heating process, the temperature was held at 900 °C for 210 min for pressure control and the homogenizing of the materials. And, in the case of beryllium to CuCrZr HIPping, HIP was conducted at 580 °C and 100 MPa for 2 hours. The canning plates were removed by electro-discharge machining. The materials were cleaned in ethyl alcohol by using an ultrasonic cleaner. For the high heat flux test in our KoHLT-1 facility, the normal cycle is based on an expected heat flux of 1.25 MW/m² for 300 seconds. After finishing this low heat flux test, electron-gun test facility will be utilized for the test in the heat flux of 5 MW/m².

ITER first wall mockups to establish the manufacturing capability of semi-prototype were fabricated in the shape of various type and standard mockups with single beryllium tile. Each standard mockup must be endured the 1,000 normal cycles in the heat flux of 1.25 MW/m² by using KoHLT-1 test facility. These tests will be performed for the purpose of qualifying the joining technologies required for the ITER first wall and semi-prototype.

[1] Y.D. Bae, *et al.*, Fusion Sci. Tech., 56, 2009, 91-95.

[2] J.Y. Park, *et al.*, Fusion Eng. Deg., 84, 2009, 1468-1471.