Contribution ID: **783** Type: **not specified**

P2.212 Effects of specimen thickness on high-temperature tensile and creep properties of F82H reduced-activation ferritic/martensitic steel

Tuesday, 18 September 2018 11:00 (2 hours)

A reduced-activation ferritic steel, F82H steel, is the primary candidate structural material for fusion blanket. Neutron irradiation properties are estimated by using miniature specimens. Since the thickness of the gauge section of the miniature tensile specimens and of wall thickness for creep tubes is less than 1 mm, deformation volume is much smaller than that of standard size specimens. The present study seeks the effect of thickness of the miniature specimens on tensile tests and creep properties. In addition, effects of specimen size are discussed based on comparisons with standard specimen data.
SSJ type specimens with a gauge length of 5 mm and a gauge width of 1.2 mm were machined from a 15 mm-thick plate of F82H-IEA heat. The gauge thickness was varied from 0.14 mm to 1.2 mm. Tensile tests at room temperature (RT) and 650℃ were conducted. The initial strain rate for the tensile tests was 6.7 x 10^-4. Creep tests were performed under 75 to 120 MPa at 650℃. Some of the tests were terminated at 100 h to measure the creep strain in direct with digital microscope.
Effects of specimen thickness on yield strength, ultimate tensile strength and uniform elongation were not significant in the tensile tests at RT and 650℃, while total elongation was obviously decreased with decreasing specimen thickness. Less and asymmetric necking was observed after fracture for the thinner specimens, and indicated much localized deformation, while extensive and symmetric necking occurred for the thicker specimens. The less necking deformation is probably caused by less activation of shear slip bands, and lead to the degradation of total elongation. Increase in creep strain was observed for the thinnest specimen after 100 h test under 120 MPa at 650℃. Effect of the surface on creep deformation will be discussed.

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Session Classification: P2