STABILITY OF FINE PRECIPITATES IN RAFM DURING HEAT TREATMENTS OF BLANKET FABRICATION

H. Sakasegawa[1], H. Tanigawa[1], S. Kano[2], and M. Enomoto[2]

[1] *Japan Atomic Energy Agency*
[1] *Ibaraki University*

Corresponding author: sakasegawa.hideo@jaea.go.jp

Reduced Activation Ferritic/Martensitic steels (RAFMs) are leading candidates for the structural material of DEMO blanket module, and they are really used for the ITER test blanket module. Through the Broader Approach (BA) activity in Japan, the fabrication techniques for the DEMO blanket module has been studied and developed. In the techniques, the development of joining technique is especially important, because of the complicated structure of blanket module. In particular, Hot Isostatic Pressing (HIP) has been applied to joining cooling channels with a rectangular cross section. During and after HIP, the structural material are exposed to various heat treatments such as holding at the HIP temperature, following furnace cooling, 2nd normalizing to refine austenite grains, and 2nd tempering [1]. Microstructural evolutions during these various heat treatments should be focused, because they determine the performance of the blanket module. Especially, fine precipitates such as tantalum and vanadium carbides precipitated at high temperatures greatly affect the creep property, the material toughness, and irradiation resistances of RAF as the structural material.

In this work, we have studied the stability of fine precipitates in the F82H-BA07 heat (8Cr-2W-V, Ta) during simulated heat treatments of the blanket fabrication. It should be noted that secondary smelting using Electro Slag Remelting (ESR) was conducted for the heat in order to completely disperse tantalum carbides, because tantalum tends to form large complex oxides with aluminum [2]. Fig. 1 shows the normalizing temperature dependence of Vickers hardness and prior austenite grain size. Hardness and grain size varied depending on normalizing temperature. This dependence is affected by the precipitation morphology of fine tantalum carbides.

In this presentation, the stability of fine precipitates during various heat treatments is discussed, taking into account some observation results of Fe-Ta-C system model steels.

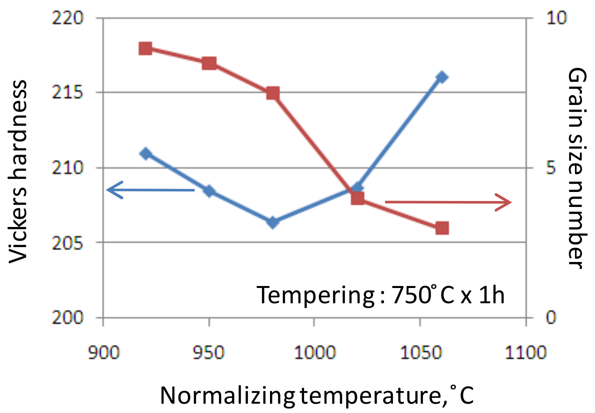

Figure 1: Normalizing temperature dependence of hardness and prior austenite grain size

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