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Effect of microstructural features on hardness in simulated heat affected zone of an advanced low-alloyed steel

Z.S Yu [a,c], F. Sun [b,*], J.X. Zhang [a], H.Z. Wang [c], Y. Yuan [c], L. Zhao [c], X. Liu [c]

[a] State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, 28 Xianning West Road, Xi'an 710049, China

[b] Research Center for Structural Materials, National Institute for Materials Science, Sengen 1-2-1, Tsukuba 305-0047, Japan

[c] Xi'an Thermal Power Research Institute Co. Ltd., 136 Xingqing Road, Xi'an 710032, China

Abstract: The low-alloyed creep-resistant T24 steel was designed as prospective material for membrane water walls in modern ultra-super critical power generation. In this study, T24 steel was subjected to welding thermal simulation. After simulation, short time thermal exposure at different temperatures was conducted to study the effect of microstructural evolution on related hardness in the simulated heat affected zone. The results of Vickers hardness tests measurements exhibit a slight decrease at 750 ˚C in base T24 steel. While, the hardness decreases obviously at 650 ˚C in the heat-affected zone after welding thermal simulation due to the carbide formation at the grain interior and coarsening at grain boundaries with the increasing thermal exposure time. At 750 ˚C, the coarsening of bainite lath in thickness direction occurs in base steel and heat-affected zone after welding thermal simulation. Detailed microstructure features at the grain interior and grain boundaries were investigated and analyzed.

Keywords: T24 steel; microstructure; hardness; welding thermal simulation; heat-affected zone; transmission electron microscopy (TEM)

1. Introduction

The ultra-super critical (USC) boiler operates at higher efficiency resulting in lower CO_2 emission and lower fuel consumption for electricity generation. Increasing thermal efficiency of power units and decreasing the emission of pollutions into the atmosphere are connected

* Corresponding author. Tel.: +81 29 8592557.
E-mail address: SUN.Fei@nims.go.jp