Effects of fabrication procedure on microstucture and mechanical

properties for CLAM rectangular tube

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Abstract:

The helium flow channels of DFLL-TBM for EAST will be made by China low activation martensitic (CLAM) steel. For good cooling effect, the helium flow channels of TBM was designed to rectangular tubes. As a kind of Reduced Activation Ferritic/Martensitic steel, the ductiliy of CLAM steel is poor, so it is necessary to analyse the fabrication process of CLAM rectangular tubes of First Wall (FW).

In present work, The CLAM bars with diameter 40mm were pierced into round tubes at 1200°C.The as-pierced tubes, diameter and thickness of which were 45mm,4.5mm respectively, were annealed: heating to 980°C and holding for 30min under vacuum, controlled cooling at 10°C/h down to 600°C, then Furnace Cooling (FC). The diameter and thickness of as-annealed tubes were reduced to 27mm, 2.2mm respectively, by several cold-drawings. After every cold-drawing, the round tubes were tempered: heating to 800°C and holding for 45min, then FC to Room Temperature (RT). At last, the as-received round tubes were cold-rolled to rectangular tubes with 25×20 (outer dimensions of cross section) $mm^2 \times 2.2$ (thickness) $mm \times 2000$ (length) mm.

The samples for tensile testing and hardness were obtained from short and long side of the rectangular tubes. This work showed that the grains caused by rolling were elongated after drawing, and the fabrication process of rectangular tube could be feasible to the manufacture of the breeding blanket component.