ABSTRACT

THE INFLUENCE OF ADDING Mo ON THE HARDNESS, MICROSTRUCTURE, AND PHASE FORMED IN ZIRLO-Mo PLATE

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The fabrication of zirlo-Mo plate has been done as the base of improvement for the new generation of nuclear fuel cladding. The combination of zirlo-Mo which was fabricated had the composition as Zr-1%Sn-1%Nb-0.1%Fe with the variation of Mo as 0.3%; 0.4%; and 0.5%. The processes of fabrication were β-quenching, hot rolling, annealing at the temperature of 760°C, cold rolling of 1.5 mm, annealing at the temperature of 650°C, cold rolling of 1 mm, and annealing at the temperature of 500°C. Result of the research showed that Mo could increase the hardness, decrease the size of grain, stabilize the phase of β-Zr, and form the second phase as $ZrMo_2$. In the process of β-quenching, it showed the decrease in the size of grain, increase in hardness, and formation of phase β-Zr and $ZrMo_2$. Hot rolling could increase the hardness of zirlo- Mo, change the form of grain to be straight-lengthways ahead of the roll, and there was a transformation phase to α-Zr and $ZrMo_2$. In all the processes of annealing in this research, they showed the process of grain recovery which had the effect towards the decrease in the hardness of the combination. On the other hand, the process of cold rolling could increase the hardness of the combination which was followed by the change of grain size to be straight-lengthways ahead of the roll. The lowest hardness occurred in the process of β-quenching on ZM-0 with the Vickers hardness value (1,83 ± 0,117) GPa and the highest hardness occurred in the process of hot rolling on ZM-0,5 with the Vickers hardness value (3,60 ± 0,257) GPa.

Keywords: zirlo-Mo, β-quenching, rolling, annealing, hardness, microstructure, and phase.