

Aging Effect on Mechanical Behavior of Duplex Stainless Steel

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Abstract : In the present study, the effect of Si, Al, Ti, Zr, and Nb addition on the microstructure and hot workability of cast M42 tool steels, basically consisting of 1.0 C, 0.2 Mn, 3.8 Cr, 1.5 W, 8.5 Co, 9.2 Mo, and 1.0 V in weight percent has been investigated. Tool steels containing Si of 0.25 and 0.5 wt.%, Al of 0.06 and 0.12 wt.%, Ti of 0.3 wt.%, Zr of 0.3 wt.%, and Nb of 0.3wt.% were cast into ingots of 140 mm x 140 mm x 330 mm by vacuum induction melting. After solution treatment at 1150 °C for 1.5 hr followed by furnace cooling, hot rolling at 1180 °C was conducted on the ingots. Addition of titanium, zirconium and niobium was found to retard the decomposition of the eutectic carbides and result in the deterioration of hot workability of the tool steels, while addition of aluminum and silicon showed relatively well decomposed carbide structure and resulted in sound hot rolled plates.

Keywords : duplex stainless steel, alloying elements, eutectic carbides, microstructure, hot workability

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