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Evolution of microstructure and phase composition of Ti-3Al-5Mo-4.5V alloy with varied β phase stability

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Abstract

The microstructure evolution and phase composition of an α + β titanium alloy, Ti-3Al-5Mo-4.5V (wt%), has been investigated. Electron probe micro analysis (EPMA) quantitative results manifest that the stability of β phase decreases with increasing quenching temperature, which is influenced by the significant concentration variation of β-stabilizing elements. Detailed microstructure analysis shows that the β→ω phase transformation does occur when quenching at 750 °C and 800 °C. The ω-reflections change from incommensurate ω-spots (750 °C) to ideal ω-spots (800 °C) as the β stability of the alloy decreases. Further decreasing β phase stability encourages the formation of athermal α" martensite, which has the following orientation relationships: $[111]_{\beta}$ // $[110]_{\alpha''}$, $[100]_{\beta}$ // $[100]_{\alpha''}$ and $[-110]_{\beta}$ // $[00-1]_{\alpha''}$ with respect to the β matrix.