**Phase transformation cycle $\beta \rightarrow \alpha' + \alpha + \alpha'' \rightarrow \beta$ in Ti6Al4V alloy**

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**Abstract**

The $\beta$-phase transforms to $\alpha'$, $\alpha$ and $\alpha''$ within a range of temperature from the $\beta$-transus ($T_\beta$) to about 600°C, considering no external stress is applied. Two types of microstructure were obtained: acicular martensite when rapidly cooled and lamellar $\alpha/\beta$ when slowly cooled from the $\beta$ phase field. The sequential transformation of $\beta$ into $\alpha'$, $\alpha$-phase, $\alpha_2$, and $\alpha''$ was revealed as peaks on the coefficient thermal expansion (CTE) curves, however, reversed transformations: $\alpha'' \rightarrow \beta$, and $\alpha \rightarrow \beta$, were revealed by the DSC thermograms. The presence of $\beta$, $\alpha'$, $\alpha$, $\alpha_2$ and $\alpha''$ was identified by means of XRD analysis and HRTEM.