

Materials Chemistry and Physics

Grain structure orientational change in Ti6Al4V alloys induced by sea water quenching and novel stress relief annealing process

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Abstract

We report on the microstructures and properties of Ti6Al4V alloys, which were achieved upon quenching in sea water medium with potential high cooling rate. The Ti6Al4V alloys were quenched at 1000 and 1100 °C, respectively. Moreover, the effect of post-quenching annealing performed at 900 °C was analyzed. As a result, the quenched alloy experienced surface thermal stress, due to rapid cooling and thermal shock, due to exposure to high temperature annealing. The alloy quenched at 1000 °C developed equiaxed grain structure after annealing, while the 1100 °C-quenched alloy generated irregular shaped lamellae structures. TEM analysis for the 1000 °C-quenched samples revealed the α' -martensite decomposed into the equilibrium $\alpha + \beta$ phases. Moreover, the 1100 °C-quenched Ti6Al4V alloy revealed an α' -acicular martensitic structure.