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Effect of solution treatment on the microstructure, micromechanical properties, and kinetic parameters of the ? ? ? phase transformation during continuous cooling of Ti-6Al-4V titanium alloy

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Abstract: The aim of this study is to examine the effect of solution treatment temperature (STT) on the microstructure, the micromechanical properties, and the kinetic parameters of the ? ? ? phase transformation during continuous cooling of the dual phase titanium alloy Ti-6Al-4V. Increasing the STT from 1050 °C to 1200 °C delays the formation of the ? phase during cooling and increases the value of its activation energy. The microstructural analysis reveals the emergence of ?W platelets from protuberances on the ?GB / ?W interface. The investigation of the morphology of the ?W platelets reveals the presence of ledges on their longest side showing a sharp extremity. The micromechanical properties determined by nanoindentation and microhardness tests are almost insensitive to the cooling rate but are strongly affected by the STT; the higher the STT, the lower the overall microhardness of the Ti-6Al-4V alloy. In addition, the STT affects the microhardness and the Young's modulus of both ? and ? phases differently; when the STT increases, the microhardness and the Young's modulus of the ? phase decrease whereas those of the ? phase increase.

Keywords : Ti-6Al-4V, solution treatment, ledge mechanism, interface instability, Nanoindentation, partitioning