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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