Microstructure, texture, and tensile properties of the 50% hot-rolled and subsequent heat treated Ti6Al4V-5Cu alloy.

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Abstract

In order to investigate the influence of 50% hot-rolling on the microstructure, textural evolution, and tensile properties in Ti6Al4V-5Cu alloy, an electron backscattered diffraction (EBSD) was used. To obtain a reduced textural influence behavior on the alloy, dual heat treatment schedule was specially designed. The results show that hot-rolling at high temperature significantly promote the transformation of phases to a fully α-phase structure and lamellar microstructure with different grains structure starting from elongated to coarsened appearance was produced. Hot-rolling deformation contributed for increasing the alloy texture intensity, whereas the heat treatment is important for weakening textural intensity, however, the coarsening of grains are prominent. Deformation and heat treatment temperature, therefore, an important factor affecting the texture and grain size. Using tensile testing experiment by considering 0.02 strain offset method, the yield strength of the alloy were estimated. During tensile testing process, studying strength of a material is the primary concern. Material strength could be measured in terms of either the stress essential to cause noticeable plastic deformation or the maximum stress that material can withstand. The tensile testing also provides information on the material's ductility behavior to measure how much the alloy can be deformed before fractured. Using specimen sectioned in rolling direction (90°), the true stress-strain curve revealed that the strength at which the alloy has significant plastic deformation under 0.02 offset yield strength method. The alloy revealed 35 MPa yield strength at 800 °C and its area reduction reached 168.5%, and elongation reached up to 83%.