

Development of Impressive Tensile Properties of Hybrid Rolled Ta_{0.5}Nb_{0.5}Hf_{0.5}ZrTi_{1.5} Refractory High Entropy Alloy

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Abstract : The microstructure, texture, phase stability, and tensile properties of annealed Ta_{0.5}Nb_{0.5}Hf_{0.5}ZrTi_{1.5} alloy have been investigated in the present research. The alloy was severely hybrid-rolled up to 93.5% thickness reduction, subsequently rolled samples subjected to an annealing treatment at 800 °C and 1000 °C temperatures for 1 h. Consequently, the rolled condition and both annealed temperatures have a body-centered cubic (BCC) structure. Furthermore, quantitative texture measurements (orientation distribution function (ODF) analysis) and microstructural examinations (analytical electron backscatter diffraction (EBSD) maps) permitted to establish a good relationship between annealing texture and microstructure and universal testing machine (UTM) utilized for obtaining the mechanical properties. Impressive room temperature tensile properties combination with the tensile strength (1380 MPa) and (24.7%) elongation is achieved for the 800 °C heat-treated condition. The evolution of the coarse microstructure featured in the case of 1000 °C annealed temperature ascribed to the influence of high thermal energy.

Keywords : refractory high entropy alloys, hybrid-rolling, recrystallization, microstructure, tensile properties

Conference Title : ICAHEA 2021 : International Conference on Advances in High-Entropy Alloys

Conference Location : London, United Kingdom

Conference Dates : March 15-16, 2021