Ultra-High Strength Ti Grade 4 Prepared by Intensive Plastic Deformation

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The aims of the present work were focused on evaluation of the processing steps on the microstructure and mechanical properties of titanium grade 4 material. The rod was subjected to Conform SPD processing which combined multiple passes throughout the ECAP with consequential cold working which reduced the sectional area by 80%. The microstructure of the prepared material was well-refined showing presence of phases whith sub-micrometre dimensions. The mechanical properties of these materials were evaluated by hardness measurements and by compressive strees-strain tests and by tensile stress-strain tests, both performed at laboratory temperature. The highest hardness of 330 ± 6 HV 1 was achieved by the material prepared by Conform SPD process while the same material in its initial state showed hardness of only 170 ± 4 HV 1. The Conform SPS process also increased the compressive yield strength and compressive strength reaching 1033 MPa and 1608 MPa, respectively, while the tensile test resulted in yield strength and ultimate tensile strength of 1136 MPa and 1142 MPa, respectively.

Keywords: Ti grade 4, equal channel angular pressing, cold working, microstructure, mechanical properties

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