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Fabrication of Biomedical Titanium Alloys with High Strength and Low Modulus by Spark Plasma Sintering

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Ti-24Nb-4Zr-8Sn, abbreviated as Ti2448 from its chemical composition in weight percent, is a multifunctional β type titanium alloy with body centered cubic (bcc) crystal structure, and its highly localized plastic deformation behavior contributes significantly to grain refinement during conventional cold processing. In the paper, in order to explore an effective method to fabricate biomedical Ti alloy with high strength and low modulus, Ti2448 alloy powders were synthesized via mechanical alloying and subsequently ultrafine-grained Ti alloy with high strength and low modulus were fabricated via the spark plasma sintering. The effects of sintering temperature on the microstructure of the synthesized Ti2448 were investigated using scanning electron microscope (SEM) and transmission electron microscope (TEM). Also the effects of ball milling and SPS conditions on the mechanical property in the low temperature of the Ti2448 alloy have been discussed. Such Ti alloys with noteworthy mechanical properties in low temperature region promote their potential applications for cryogenic and biomedical equipments.

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