Michigan State University

Science at the Edge

Engineering Seminar

October 19, 2018
11:30 a.m., Room 1400 Biomedical and Physical Sciences Building
Refreshments served at 11:15 a.m.

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New Biomedical Ti-Nb-Ta-Zr Alloys Show High Superelasticity

Abstract

Ti-Nb-Ta-Zr alloy system is promising for biomedical applications due its excellent biocompatibility. Achieving high superelastcity in this Ni-free biomedical alloy will widen its application for dental and spinal fixation implants. Here we investigates the effect of Nb, Ta and Zr alterations on the phase stability, cold deformation, and elastic strain recovery of new Ti-Nb-Ta-Zr alloys which were designed along the β/β+ω metastable phase boundary and produced by arc melting. β-phase was predominant in most alloys in the homogenized condition while stress induced martensitic transformation (SIM) were observed during/after cold deformation. Cyclic compression tests were carried out on the alloys and an outstanding combination of strength-elasticity properties was obtained with a relatively low strength of 250MPa for SIM transformation. Unique superelasticity in compression was observed in all the alloys which ranged from 2% - 9.5% that increases with lowering β-phase stability.

Bio

Dr. Gebreel got his PhD from Nagoya University, Japan in 2008. He worked in Nagoya University then Tohoku University, Japan, till 2010 when he moved to E-JUST. He is specialist in alloy design and microstructure control. He worked in developing New generation of Ti-alloys for biomedical applications, Ultra-high strength Ti-alloys, Negative and zero thermal expansion alloys and recently in High entropy alloys. He received the State's Award (Egypt) in Engineering, 2014. He had 7 funded research projects and more than 80 publications [including filed Patents, Book chapters, Journal papers, and international conferences]

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