Advances in Automobile Engineering

ISSN: 2167-7670

Extended Abstract

Materials Science and Nanotechnology: The composition dependence on the phase stability and mechanical properties of the Ti-Nb-Zr thin - Munkhbayar Baatarsukh - Gyeongsang National University, South Korea

Munkhbayar Baatarsukh

Abstract

Statement of the Problem: Shape memory alloys are commonly used for various application, e.g., aerospace, automotive, robotics and biomedical. Ti-Ni alloys have been extensively applied for biomedical uses to date, but it has been pointed out that pure Ni is a toxic element and causes Ni-hypersensitivity. The β-type titanium alloys attracted to attention for bio-medical because of their low stiffness, good corrosion resistance and biocompatible. The purpose of this study is to investigate the addition of Zr elements dependence on phase stability and mechanical properties of the β Ti-Nb-Zr thin films.

Method: The Ti-Nb-(3.6-12.7)Zr at thin films were prepared by magnetron sputtering method. The structures of the thin films were analyzed by EDS and SEM. Phase constitutions were confirmed by XRD. Mechanical properties of the Ti-Nb-Zr thin film specimens were investigated by nanoindentation test. The d-electrons alloy theory is an effective method of designing titanium alloys with a controlled Young's modulus.

Results: The additional Zr content does not change crystallographic in the ternary alloy,α and β phases appear at alloys. The porous structures were observed in Ti-Nb-3.6Zr and Ti-Nb-5.6Zr thin films. Young's modulus decreased from 94.65 Gpa to 79.78 Gpa in ternary alloy with additional Zr content.

Conclusion: The addition of the Zr to stabilize both α and β phases in titanium alloys, does not considerably influence the formation of α phases in TiNbZr alloy. In bulk, in order to control porous structure, there is used to space holder (NH4CO3) in sintering method. In the present, we expected to porous structure dependent on composition. The result of Young's modulus confirmed to d-electro alloy theory for ternary alloy. However, Young???s modulus of ternary thin films (80-95 Gpa) lower than binary alloys (108-123Gpa).

This work is partly presented at 35th World Congress on Materials Science and Nanotechnology 2019, July 22-23, 2019

Munkhbayar Baatarsukh
Gyeongsang National University, South Korea, E-mail: mundag9911@gmail.com