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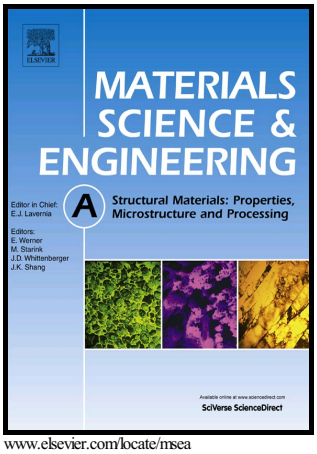
Olga Ivanova, Olexandr Shcheretsky, Yuriy Podrezov, Myroslav Karpets



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Young's modulus and damping capacity of Ti_3Sn intermetallic compound with 1at.% and 3at.% of Zr and Al additions

Olga Ivanova[a*], Olexandr Shcheretsky[b], Yuriy Podrezov[a], Myroslav Karpets[a]

[a]Frantsevich Institute for Problems of Materials Science, National Academy of Sciences of Ukraine, 3 Krzhyzhanovsky str., Kiev 03142, Ukraine

[b]Physico-technological Institute of Metals and Alloys, National Academy of Sciences of Ukraine, 34/1 Vernadsky Ave.,Kiev 03142, Ukraine

[*]Corresponding author. Frantsevich Institute for Problems of Materials Science, National Academy of Sciences of Ukraine, 3 Krzhyzhanovsky str., Kiev 03142, Ukraine

Abstract

Intermetallic compound Ti_3Sn was shown to exhibit a martensitic transformation from parent hexagonal to orthorhombic phase leading to high damping capacity and low Young's modulus of the material. Present work is dedicated to studying the mechanical behavior of non-stoichiometric intermetallic compound $Ti_{75.5}Sn_{24.5}$ with 1at.% and 3at.% of Zr and Al additions by dynamical mechanical analysis and compressive tests. Zr and Al additions decrease martensitic transformation temperatures and widen the temperature hysteresis. Studied alloyed compositions exhibited higher Young's modulus and compressive yield stress and lower damping capacity than binary $Ti_{75.5}Sn_{24.5}$ alloy.

Keywords: Dynamic mechanical analysis, Martensitic phase transformation, Young's modulus, Damping, Intermetallic compound

1 Introduction

Recently, Ti_3Sn intermetallic compound has been reported to exhibit high damping capacity (up to tan δ=0.2) and low Young's modulus (reaching 5GPa) associated with martensitic transformation occurring at about 350 K [1]. Reported damping capacity of Ti_3Sn is higher than those of Mg–Cu-based high-damping alloys (with tan δ of about 0.13) [2] and than for TiNi (with tan δ of about 0.08) [3] therefore Ti_3Sn intermetallic compound was considered as a promising material for applications in high-damping systems [1,4]. Low Young's modulus in conjunction of good biocompatibility of this material makes it attractive for biomedical use. According to [1,4] the origin for high damping capacity and Young's modulus is a martensitic