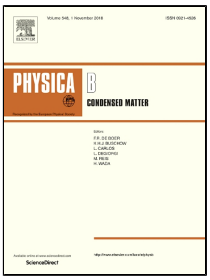
Accepted Manuscript



Microstructure and Thermodynamic Investigation of Ni-Ti System Produced by Mechanical Alloying

A. Rostami, G.A. Bagheri, S.K. Sadrnezhaad

PII:	S0921-4526(18)30639-2
DOI:	10.1016/j.physb.2018.10.015
Reference:	PHYSB 311100
To appear in:	*Physica B: Physics of Condensed Matter*
Received Date:	12 September 2018
Accepted Date:	08 October 2018

Please cite this article as: A. Rostami, G.A. Bagheri, S.K. Sadrnezhaad, Microstructure and Thermodynamic Investigation of Ni-Ti System Produced by Mechanical Alloying, *Physica B: Physics of Condensed Matter* (2018), doi: 10.1016/j.physb.2018.10.015

Microstructure and Thermodynamic Investigation of Ni-Ti System Produced by Mechanical Alloying

A. Rostami[a], G.A. Bagheri[b*], S.K. Sadrnezhaad[b]

[a] School of Electrical and Computer Engineering, University of Tehran, P.O. Box: 1439957131, Tehran, Iran

[b] Department of Materials Science and Engineering, Sharif University of Technology, Azadi Ave., P.O. Box: 11155-9466, Tehran, Iran

[a]abrostami@ut.ac.ir, [b]gh.a.bagheri65@gmail.com, [c]sadrnezh@sharif.edu

Abstract

In this study, an equiatomic mixture of Ni and Ti powders has been mechanically milled for 180h in a planetary mill in order to study the product phase of milling process. Miedema's semi empirical method has been used in order to calculate the energy of solid solution and amorphous phases and the effect of defects like dislocations and grain boundaries have been considered in this thermodynamic approach. The results showed that amorphous phase is more stable than solid solution after mechanical milling process. It seems these results are in contrast with Mousavi et al. [1] results but there are some points that we should consider in this approach. Applying of common tangent rule and considering the grain boundaries and dislocation energies in this thermodynamic approach lead to anticipating of amorphous phase as the stable phase after mechanical alloying process while lack of considering these terms in Mousavi et al study led to different results. The milled powders has been heat treated at 950^{o}C for 20 minutes and finally, XRD and SEM analysis have been performed in order to evaluate experimental phases and compare experimental and theoretical results. Crystallite size and lattice strain have been calculated using Williamson-Hall equation and XRD patterns.