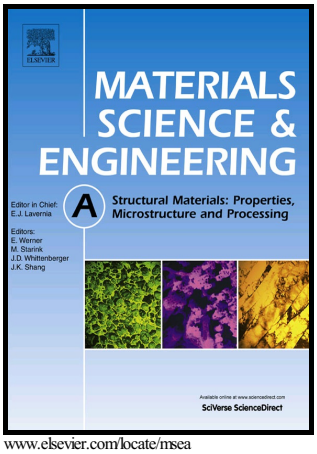
Phase transformation and shape memory effect of a Cu-Al-Ni-Mn-Nb high temperature shape memory alloy

E.M. Mazzer, C.S. Kiminami, C. Bolfarini, R.D. Cava, W.J. Botta, P. Gargarella, F. Audebert, M. Galano



www.elsevier.com/locate/msea

PII: S0921-5093(16)30223-4
DOI: http://dx.doi.org/10.1016/j.msea.2016.03.017
Reference: MSA33412

To appear in: *Materials Science & Engineering A*

Received date: 19 November 2015
Revised date: 2 March 2016
Accepted date: 3 March 2016

Cite this article as: E.M. Mazzer, C.S. Kiminami, C. Bolfarini, R.D. Cava, W.J Botta, P. Gargarella, F. Audebert and M. Galano, Phase transformation and shape memory effect of a Cu-Al-Ni-Mn-Nb high temperature shape memory alloy *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2016.03.017

Phase transformation and shape memory effect of a Cu-Al-Ni-Mn-Nb high temperature shape memory alloy

E. M. Mazzer[1,2*], C. S. Kiminami[1], C. Bolfarini[1], R. D. Cava[1] , W.J.Botta[1], P.Gargarella[1], F. Audebert[2,3,4], M. Galano[2]

[1] Department of Materials Engineering, Federal University of São Carlos, São Carlos, SP, Brazil

[2] Department of Materials, University of Oxford, Parks Road, OX1 3PH, Oxford, UK

[3] INTECIN, Faculty of Engineering, University of Buenos Aires, Paseo Colon 850, (1063) Ciudad de Buenos Aires, Argentina

[4] Department of Mechanical Engineering and Mathematical Sciences, Oxford Brookes University, Wheatley Campus, OX33 1HX, Oxford, UK

eric.marchezinimazzer@materials.ox.ac.uk

ericmazzer@gmail.com

[*]Corresponding author.

Abstract

The microstructure, phase transformation and shape memory effect of the high temperature shape memory alloy Cu-11.4Al-3.2Ni-3Mn-0.5Nb (wt%) were investigated for the first time. The shape recovery ratio can achieve 73% when submitted to 690 MPa and the compressive stress of fracture of the alloy is 1560 MPa.

Keywords: Copper alloys; shape memory alloys (SMA); phase transformation

Introduction

High temperature shape memory alloys (HTSMAs) have been attracting the attention of research groups due to their possible suitability for engineering applications in thermosensitive devices that operate above 100^{o}C [1]. For this purpose, the phase transformation involving the shape memory effect must be above this temperature. The most widely used shape memory alloy (SMA) NiTi does not fit this requirement and can be only be used up to about 80^{o}C [2]. Therefore, many attempts have been made on the Ni-Ti system to shift the martensitic transformation to higher temperatures by the addition of different elements thus obtaining the ternary system Ni-Ti-X (X=Zr, Pd, Hf) [3-9] . However, these alloys' drawback is their high production challenges such as high reactivity of the elements with oxygen and furthermore the high production costs associated. Hence, the