Accepted Manuscript

Enhancing the Life Cycle Behaviour of Cu-Al-Ni Shape Memory Alloy Bimorph by Mn Addition

K. Akash, S.S. Mani Prabu, Tobias Gustmann, S. Jayachandran, Simon Pauly, IA. Palani

PII: S0167-577X(18)30743-2
DOI: https://doi.org/10.1016/j.matlet.2018.05.008
Reference: MLBLUE 24308

To appear in: *Materials Letters*

Received Date: 28 February 2018
Revised Date: 12 April 2018
Accepted Date: 1 May 2018

Please cite this article as: K. Akash, S.S. Mani Prabu, T. Gustmann, S. Jayachandran, S. Pauly, IA. Palani, Enhancing the Life Cycle Behaviour of Cu-Al-Ni Shape Memory Alloy Bimorph by Mn Addition, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.05.008

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Enhancing the Life Cycle Behaviour of Cu-Al-Ni Shape Memory Alloy Bimorph by Mn Addition

Akash K[1*], Mani Prabu S S[2], Tobias Gustmann[3], Jayachandran S[1], Simon Pauly[3], Palani I A[1,2]

[1]Mechatronics and Instrumentation Lab, Indian Institute of Technology Indore, Simrol, India 453552
[2]Metallurgy Engineering and Materials Science, Indian Institute of Technology Indore, Simrol, India 453552
[3] IFW Dresden, Institute for Complex Materials, Dresden, Germany-01069
akash.k1806@gmail.com, palaniia@iiti.ac.in

Contact no: +91 9009356097, +91 9039121747

Abstract

Cu-Al-Ni and Cu-Al-Ni-Mn shape memory alloys are deposited on Kapton polyimide sheets by a physical evaporation technique. Detailed investigations on the morphological, structural and thermal behaviour of the ternary and quaternary alloys are conducted. The developed samples exhibit an increase in martensite structures and decrease in transformation temperatures after Mn additions. Furthermore, the suppression of Cu_3Al precipitates was evident from XRD analysis. The thermomechanical behaviour was analysed by actuating the bimorphs through Joule heating under varying mechanical loads. Fatigue analysis of the bimorphs reveals a superior performance for Cu-Al-Ni-Mn, exhibiting less than 30% loss in displacement after 15,000 cycles.

Keywords: Shape memory alloys, Cu-Al-Ni, Thin film, Thermomechanical, Life Cycle, Actuation, Bimorph.

1. Introduction

Flexible substrates are beneficial for depositing shape memory alloy (SMA) thin films, as they can act along with the material deposited on them. Substrates such as polyethylene terephthalate and polyimide have been utilised in developing flexible actuators [1–3]. Kapton polyimide substrates are more suitable for developing copper-based SMAs as they can withstand high temperatures up to 500 °C. Recently, the development of Cu-Al-Ni/polyimide SMA

Download English Version:

https://daneshyari.com/en/article/8012767

Download Persian Version:

https://daneshyari.com/article/8012767

Daneshyari.com