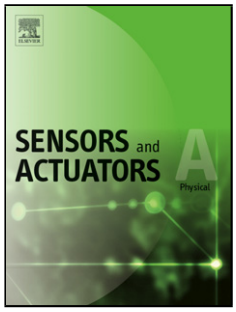
Accepted Manuscript



Title: Comparison of Mold Designs for SMA-based Twisting Soft Actuator

Author: Hugo Rodrigue Wei Wang Min-Moo Han Ying-Jun Quan<ce:author id="aut0025" biographyid="vt0025" orcid="0000-0002-1548-2394"> Sung-Hoon Ahn

PII: S0924-4247(15)30243-0
DOI: http://dx.doi.org/doi:10.1016/j.sna.2015.11.026
Reference: SNA 9417

To appear in: *Sensors and Actuators A*

Received date: 17-6-2015
Revised date: 20-11-2015
Accepted date: 24-11-2015

Please cite this article as: Hugo Rodrigue, Wei Wang, Min-Moo Han, Ying-Jun Quan, Sung-Hoon Ahn, Comparison of Mold Designs for SMA-based Twisting Soft Actuator, Sensors and Actuators: A Physical http://dx.doi.org/10.1016/j.sna.2015.11.026

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

Comparison of Mold Designs for SMA-based Twisting Soft Actuator

HUGO RODRIGUE[1,2], WEI WANG[1], MIN-WOO HAN[1], YING-JUN QUAN[1] AND SUNG-HOON AHN[1,2]*
[1]*Department of Mechanical and Aerospace Engineering, Seoul National University, South Korea*
[2]*Institute of Advanced Machines and Design, Seoul National University, South Korea*

Highlights:

- We propose new mold designs that enable new designs for SMA soft actuators.
- Fabricated actuators with new shapes, multimaterial and complex SMA wire positioning.
- Multiple solutions were combined into a single actuator to further improve performance.
- The performance was improved several folds using the proposed mold designs.

Abstract
The design of SMA-based soft actuators is often limited by the design of the molds used, and these limitations are even more pronounced for actuators with complex shape memory alloy (SMA) wire positioning such as SMA-based twisting soft actuators. This paper aims at developing new mold designs to enable new design possibilities for the fabrication of pure-twisting smart soft composite (SSC) actuators. The basic design of the actuator uses two SMA wires embedded in a polymeric matrix at opposite eccentricity and crossing the matrix in opposite directions. This positioning induces a twisting motion to the matrix during actuation, but current mold designs impose many limitations on the design of the actuator. In this work, two molds design strategies are proposed that enable three distinct approaches to improve the performance of this actuator: interference fit fastening molds and using intermediate elements to reorient the SMA wires. These solutions enable the design of I-shaped cross-sections, composite cross-sections and square-helix positioning of the SMA wires within the matrix. A base actuator size is used to compare the performance of the different strategies then three actuators using combined solutions are manufactured and tested. Results show that the improved mold design can significantly increase the performance of this type of actuator.

Keywords
Mold design, soft twisting actuator, smart soft composite (SSC), shape memory alloy (SMA)

Download English Version:

https://daneshyari.com/en/article/7135343

Download Persian Version:

https://daneshyari.com/article/7135343

Daneshyari.com