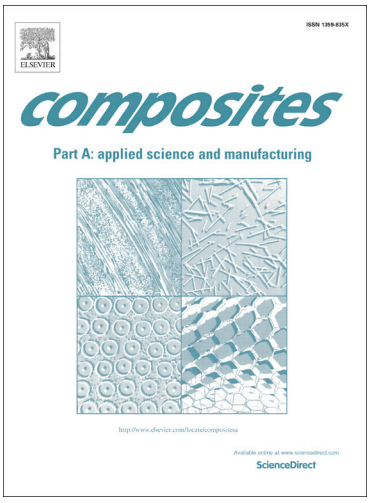

Magnetoactive elastomer/PVDF composite film based magnetically controllable actuator with real-time deformation feedback property

Jiabin Feng, Shouhu Xuan, Li Ding, Xinglong Gong

PII: S1359-835X(17)30335-4
DOI: http://dx.doi.org/10.1016/j.compositesa.2017.09.004
Reference: JCOMA 4773

To appear in: *Composites: Part A*

Received Date: 31 May 2017
Revised Date: 4 September 2017
Accepted Date: 5 September 2017

Please cite this article as: Feng, J., Xuan, S., Ding, L., Gong, X., Magnetoactive elastomer/PVDF composite film based magnetically controllable actuator with real-time deformation feedback property, *Composites: Part A* (2017), doi: http://dx.doi.org/10.1016/j.compositesa.2017.09.004

Magnetoactive elastomer/PVDF composite film based magnetically controllable actuator with real-time deformation feedback property

Jiabin Feng [a], Shouhu Xuan [ab,*], Li Ding [a], Xinglong Gong [a,*]

[a] *CAS Key Laboratory of Mechanical Behavior and Design of Materials, Department of Modern Mechanics, University of Science and Technology of China, Hefei, 230027, People's Republic of China*

[b] *National Synchrotron Radiation Laboratory, University of Science and Technology of China, Hefei, 230027, People's Republic of China*

[*] *Corresponding author: Email: xuansh@ustc.edu.cn (S. Xuan), gongxl@ustc.edu.cn (X. Gong)*

Abstract

This work reported a high performance flexible magnetically controllable actuator based on magnetoactive elastomer (MAE) and poly (vinylidene fluoride) (PVDF) composite film. The magnetic-mechanic-electric coupling properties of the actuator were systematically investigated by cyclical wrinkle, magnetic bending, and stretching test. The induced charge under a magnetic bending can reach as large as 158 pC even at small magnetic field of 100 mT with the bending angle up to almost 90 degrees within 0.6 s. Moreover, a new model was proposed to theoretically reveal the intrinsic correspondence. The model matches well with the experimental results. Based on this kind of actuator, a magnetically controllable tentacle is developed, which could grasp, transport, and release object by switching the supplied current. Due to the real-time deformation feedback characteristics, this kind of actuators can find wide applications in actively controllable engineering, artificial robotics, and biomedicine.

Keywords: A. Polymer-matrix composites (PMCs), A. Smart materials, B. Magnetic properties, B. Mechanical properties, Magnetoactive elastomer

1. Introduction

Intelligent soft active materials are of enticing prospect for the realization of specific