Accepted Manuscript

A flexible multiferroic composite with high self-biased magnetoelectric coupling

W.Q. Jing, F. Fang

PII: S0266-3538(17)30074-X

DOI: 10.1016/j.compscitech.2017.10.010

Reference: CSTE 6935

To appear in: *Composites Science and Technology*

Received Date: 10 January 2017

Revised Date: 7 September 2017

Accepted Date: 13 October 2017

Please cite this article as: Jing WQ, Fang F, A flexible multiferroic composite with high self-biased magnetoelectric coupling, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.10.010.

A Flexible Multiferroic Composite with High Self-biased Magnetoelectric Coupling

W. Q. Jing, F. Fang*

School of Aerospace, Tsinghua University, Beijing 100084, China

Abstract

Polymer-matrix multiferroic composites with self-biased magnetoelectric (ME) coupling hold promises in flexible energy harvester, magnetic field sensors and actuators, etc. Using $CoFe_2O_4$ (CFO) nanoparticles and multi-walled carbon nanotubes (CNTs) as fillers to the polyvinylidene fluoride (PVDF) matrix, piezomagnetic films (CFO-CNT-PVDF, also named as *M* layers) with different volume fractions of CFO and a fixed percentage of CNTs are obtained, which also serve as the electrode. By employing the layer of poly(vinylidene fluoride-trifluoroethylene) (P(VDF-TrFE), named as *P* layer) sandwiched between the two conductive layers of CFO-CNT-PVDF, and followed by hot-pressing, three-layered multiferroic composite CFO-CNT-PVDF/P(VDF-TrFE)/ CFO-CNT-PVDF (named as *M*/*P*/M) are prepared. The ME coupling increases with the volume fraction of CFO nanoparticles. The maximum self-biased and peak values of ME coefficient (α_{ME}) reach 16.7 $mV \cdot cm^{-1} \cdot Oe^{-1}$ and 25.8 $mV \cdot cm^{-1} \cdot Oe^{-1}$, respectively. Measurements on the relationship between the magnetostriction and static magnetic field (H_s) are performed for the CFO-CNT-PVDF films with different volume fraction of CFO. Based on the equivalent circuit model, the self-biased and peak values of α_{ME}

* Corresponding Author: fangf@mail.tsinghua.edu.cn