

Accepted Manuscript

Title: A low-working-field (2kV/mm), large-strain (>0.5%) piezoelectric multilayer actuator based on periodically orthogonal poled PZT ceramics

Authors: Qiangzhong Wang, Faxin Li

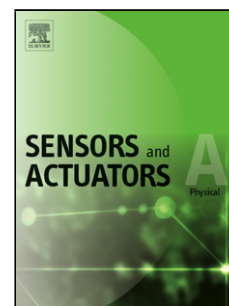
PII: S0924-4247(17)32020-4
DOI: <https://doi.org/10.1016/j.sna.2018.01.042>
Reference: SNA 10597

To appear in: *Sensors and Actuators A*

Received date: 12-11-2017
Revised date: 5-1-2018
Accepted date: 22-1-2018

Please cite this article as: Wang Q, Li F, A low-working-field (2kV/mm), large-strain (>0.5%) piezoelectric multilayer actuator based on periodically orthogonal poled PZT ceramics, *Sensors and Actuators: A Physical* (2018), <https://doi.org/10.1016/j.sna.2018.01.042>

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.



A low-working-field (2kV/mm), large-strain (>0.5%) piezoelectric multilayer actuator based on periodically orthogonal poled PZT ceramics

Qiangzhong Wang¹, Faxin Li^{1,2, a)}

¹ LTCS and College of Engineering, Peking University, Beijing 100871, China

² Center for Applied Physics and Technology, Peking University, Beijing 100871, China

a) Author to whom all correspondence should be addressed, Email: lifaxin@pku.edu.cn

Highlights

- A low-working-field (2kV/mm), large-strain (>0.5%) piezoelectric multilayer actuator was proposed;
- The actuator is based on periodically orthogonal poled PZT ceramics in which reversible domain switching can be realized;
- The large actuation strain is very stable after 20k cycles of operation but drops quickly with increasing frequency;
- The proposed actuator is very promising for low frequency, large strain actuation applications.

Abstract

In this work, we proposed a special designed multilayer actuator based on the periodically orthogonal poled (POP) PZT ceramics. Only the in-plane poled regions of the neighboring PZT layers were bonded together thus the large reversible switching strain in these regions can always be employed. A six-layer actuator was fabricated and testing results show that it can output actuation strains over 0.5% under a low field of 2kV/mm at 0.1Hz, about 3.5 times of that in conventional PZT actuators which is less than 0.15% under the same field. Furthermore, the output large strain is fairly uniform, which varies from 0.50% to 0.53% along the period direction, in comparison with that varying from 0.35% to 0.59% in a single-layer POP PZT. The large actuation strain drops quickly with the increasing frequency, and stabilized at about 0.2% under 2kV/mm at or above 1Hz. The low-frequency large strain is very stable and keeps unchanged after 20k cycles of operation. To solve the charge accumulation problem during successive unipolar loading/unloading, an asymmetric bipolar field from -300V/mm to 2kV/mm is applied and meanwhile the actuation strain turns to be more uniform, only varying from 0.51% to 0.52% at 2kV/mm. The low driving field, large strain of the proposed actuator makes it very promising in low-frequency, large strain/displacement actuation areas.

Keywords: piezoelectric actuators; multilayer; domain switching; PZT

1. Introduction

Download English Version:

<https://daneshyari.com/en/article/7133748>

Download Persian Version:

<https://daneshyari.com/article/7133748>

[Daneshyari.com](https://daneshyari.com)