

## Accepted Manuscript

Buckling and post-buckling analyses of piezoelectric hybrid microplates subject to thermo-electro-mechanical loads based on the modified couple stress theory

Jia Lou, Liwen He, Jianke Du, Huaping Wu

PII: S0263-8223(16)30774-7

DOI: <http://dx.doi.org/10.1016/j.compstruct.2016.05.107>

Reference: COST 7520

To appear in: *Composite Structures*

Received Date: 29 November 2015

Revised Date: 19 May 2016

Accepted Date: 31 May 2016



Please cite this article as: Lou, J., He, L., Du, J., Wu, H., Buckling and post-buckling analyses of piezoelectric hybrid microplates subject to thermo-electro-mechanical loads based on the modified couple stress theory, *Composite Structures* (2016), doi: <http://dx.doi.org/10.1016/j.compstruct.2016.05.107>

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.

# Buckling and post-buckling analyses of piezoelectric hybrid microplates subject to thermo-electro-mechanical loads based on the modified couple stress theory

Jia Lou <sup>a</sup>, Liwen He <sup>a,\*</sup>, Jianke Du <sup>a</sup>, Huaping Wu <sup>b</sup>

<sup>a</sup>Piezoelectric Device Laboratory, Department of Mechanics and Engineering Science, Ningbo University, Ningbo, Zhejiang 315211, China

<sup>b</sup>Key Laboratory of E&M (Zhejiang University of Technology), Ministry of Education & Zhejiang Province, Hangzhou 310014, China

## Abstract

In the present paper, the post-buckling behavior of a simply supported piezoelectric hybrid microplate subject to thermal, electrical and mechanical loads is studied. The size effect in the mechanical behavior of the microplate is captured by using the modified couple stress theory. The Mindlin plate theory is adopted to describe its deflection behavior with the von Karman's geometric nonlinearity taken into account. Based on these assumptions and the principle of minimum potential energy, the equilibrium equations of the microplate and associated boundary conditions are derived. By applying the Galerkin method to the equilibrium equations, closed-form solutions for the critical thermal/mechanical buckling load and the load-displacement relation in the post-buckling stage are obtained. Furthermore, the effects of the material length scale parameter to thickness ratio, the applied electric field and in-plane boundary conditions on the buckling and post-buckling behavior of the piezoelectric hybrid microplate are discussed in detail.

## Keywords

Buckling; Post-buckling; Piezoelectric hybrid microplate; Modified couple stress theory; Galerkin method

---

\*Corresponding author.

E-mail: [physi\\_mechanism@163.com](mailto:physi_mechanism@163.com) (Liwen He)

Download English Version:

<https://daneshyari.com/en/article/6705274>

Download Persian Version:

<https://daneshyari.com/article/6705274>

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