

Accepted Manuscript

Thermo-electro-mechanical bending behavior of sandwich nanoplate integrated with piezoelectric face-sheets based on trigonometric plate theory

Mohammad Arefi, Ashraf M. Zenkour

PII: S0263-8223(16)31811-6

DOI: <http://dx.doi.org/10.1016/j.compstruct.2016.11.071>

Reference: COST 8032

To appear in: *Composite Structures*

Received Date: 9 September 2016

Revised Date: 28 October 2016

Accepted Date: 23 November 2016



Please cite this article as: Arefi, M., Zenkour, A.M., Thermo-electro-mechanical bending behavior of sandwich nanoplate integrated with piezoelectric face-sheets based on trigonometric plate theory, *Composite Structures* (2016), doi: <http://dx.doi.org/10.1016/j.compstruct.2016.11.071>

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.

Thermo-electro-mechanical bending behavior of sandwich nanoplate integrated with piezoelectric face-sheets based on trigonometric plate theory

Mohammad Arefi^{1,a} and Ashraf M. Zenkour^{2,3,b}

¹ Department of Solid Mechanics, Faculty of Mechanical Engineering, University of Kashan, Kashan 87317-51167, Iran

² Department of Mathematics, Faculty of Science, King Abdulaziz University, Jeddah 21589, Saudi Arabia

³ Department of Mathematics, Faculty of Science, Kafrelsheikh University, Kafrelsheikh 33516, Egypt

Abstract

Thermo-electro-mechanical bending behavior of a sandwich nanoplate is studied in this paper. The trigonometric shear and normal deformations plate theory is used to study this behavior. The core is integrated with two piezoelectric face sheets to measure or control deformations or stresses. Three-dimensional electric potential containing a linear term along the thickness direction reflects applied voltage and an unknown term along the planar coordinate is employed for this analysis. The nanoplate is subjected to a two-parameter temperature rising and an applied voltage at top of piezoelectric face-sheets. Virtual work method is employed to derive the seven governing differential equations of the system. Our numerical results indicate that the temperature rising, applied voltage and nonlocal parameter have significant effects on the deflection and electric potential.

Keywords: Trigonometric plate theory; thermo-electro-mechanical bending; piezoelectric face-sheets; nanoplate; nonlocal parameter.

1. Introduction

Piezoelectric materials have different applications in electro-mechanical systems as sensor and actuator. These materials can be used to detect deformations and stresses or actuate a system. The piezoelectric materials can exchange input electric potential to mechanical deformation in actuating applications and conversely mechanical deformation to electric potential in sensor applications. Calculation of displacement or electric potential in an electro-mechanical system is one of important

^a E-mail: arefi63@gmail.com and arefi@kashanu.ac.ir (Mohammad Arefi)

^b Corresponding author: E-mail: zenkour@kau.edu.sa and zenkour@sci.kfs.edu.eg (A.M. Zenkour)

Download English Version:

<https://daneshyari.com/en/article/4912255>

Download Persian Version:

<https://daneshyari.com/article/4912255>

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