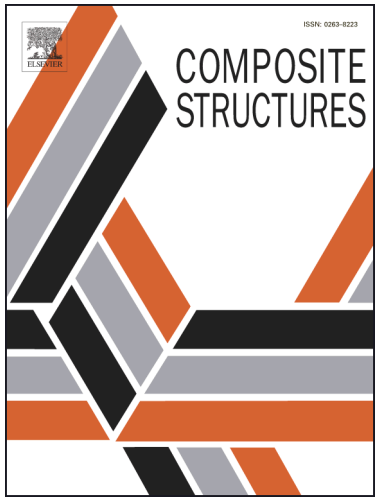

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PII: S0263-8223(16)31811-6
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.11.071
Reference: COST 8032

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

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

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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

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