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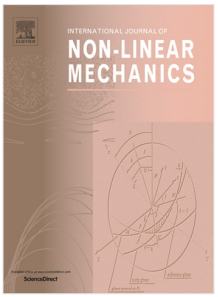

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Yibin Fu, Yuxin Xie, Luis Dorfmann

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A reduced model for electrodes-coated dielectric plates

Yibin Fu[1], Yuxin Xie[2], and Luis Dorfmann[3]

[1]School of Computing and Mathematics
Keele University, Staffordshire ST5 5BG, UK

[2]Department of Mechanics
Tianjin University, Tianjin 300072, China

[3]Department of Civil and Environmental Engineering
Tufts University, MA, USA

Abstract

We derive a reduced theory describing the incremental deformation of an electrodes-coated dielectric plate that takes the leading-order thickness effect into account. By focusing on deformations that are symmetric with respect to the mid-plane, a power series expansion of the incremental deformation and electric field in the thickness direction is used to reduce the second variation of the total energy to an optimal form. The associated Euler-Lagrange equations are then the governing equations for the reduced model. The validity of this reduced model is verified by comparing the bifurcation condition derived from it with the two-term expansion of the exact bifurcation condition in two special cases. We compare our model with another approximate theory that recently appeared in the literature.

Keywords: Nonlinear electroelasticity, dielectric membranes, Euler-Lagrange equations, stability, bifurcation.

1. Introduction

Stability and bifurcation criteria of dielectric plates and membranes have received considerable attention during the last few years. Early experimental