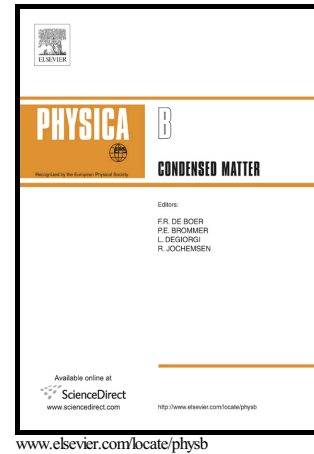


Author's Accepted Manuscript

Pull-in Instability Analysis of Rectangular Nanoplate based on Strain Gradient Theory Considering Surface Stress Effects

S. Amin Mirkalantari, Mohammad Hashemian, S. Ali Eftekhari, Davood Toghraie



PII: S0921-4526(17)30254-5
DOI: <http://dx.doi.org/10.1016/j.physb.2017.05.028>
Reference: PHYSB309952

To appear in: *Physica B: Physics of Condensed Matter*

Received date: 6 May 2017
Revised date: 13 May 2017
Accepted date: 15 May 2017

Cite this article as: S. Amin Mirkalantari, Mohammad Hashemian, S. Ali Eftekhari and Davood Toghraie, Pull-in Instability Analysis of Rectangular Nanoplate based on Strain Gradient Theory Considering Surface Stress Effects *Physica B: Physics of Condensed Matter* <http://dx.doi.org/10.1016/j.physb.2017.05.028>

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 galley proof before it is published in its final citable 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.

Pull-in Instability Analysis of Rectangular Nanoplate based on Strain Gradient Theory Considering Surface Stress Effects

S. Amin Mirkalantari, Mohammad Hashemian*, S. Ali Eftekhari, Davood Toghraie*

Department of Mechanical Engineering, Khomeinishahr Branch, Islamic Azad University,
Khomeinishahr/Isfahan, Iran

Toghraee@iaukhsh.ac.ir

Hashemian@iaukhsh.ac.ir

Abstract

In this study, a model is developed based on strain gradient, considering surface stress effect. Then, higher-order nonlinear governing equations and corresponding boundary condition for a hydrostatically and electrostatically actuated rectangular nanoplate are obtained using principle of minimum potential energy. The derived nonlinear differential equations are linearized by step-by-step linearization method, and then the obtained linear equations are discretized by generalized differential quadrature (GDQ) method. The effects of three length scale parameters, boundary conditions, thickness of nanoplate, and surface material properties on pull-in instability behavior are investigated. The obtained results demonstrate that the effects of length scale parameter can influence pull-in instability, and for greater amounts of length scale parameter, higher amounts of voltage are concluded.

Keywords: nanoplate, strain gradient theory, surface stress effect, first shear deformation theory, pull-in instability

1. Introduction

Nano and micro electromechanical systems (NEMS and MEMS) are nano/micro structures such as nano/micro beams, tubes, and plates, being electrostatically actuated. These

Download English Version:

<https://daneshyari.com/en/article/5491943>

Download Persian Version:

<https://daneshyari.com/article/5491943>

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