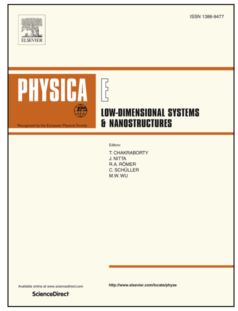

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Vibration Analysis of Rotating Nanobeam Systems using Eringen's Two-Phase Local/Nonlocal Model

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Abstract

Due to the inability of differential form of nonlocal elastic theory in modelling cantilever beams and inaccurate results for some type of boundaries, in this study, a reliable investigation on transverse vibrational behavior of rotating cantilever size-dependent beams is presented. Governing higher order equations are written in the framework of Eringen's two-phase local/nonlocal model and solved using a modified generalized differential quadrature method. In order to indicate the influence of different material and scale parameters, a comprehensive parametric study is presented. It is shown that increasing the nonlocality term leads to lower natural frequency terms for cantilever nanobeams especially for the fundamental frequency parameter which differential nonlocal model is unable to track appropriately. Moreover, it is shown that rotating speed and hub radius have a remarkable effect in varying the mechanical behavior of rotating cantilever nanobeams. This study is a step forward in analyzing nanorotors, nanoturbines, nanoblades, etc.

***Keywords*:** Rotating beam; nanobeam; Eringen's integral elasticity; vibration; GDQM; mixed local/nonlocal Eringen elasticity; nanoblade; nanoturbine.

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