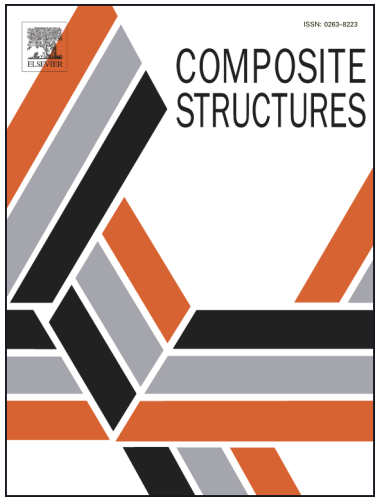

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Jiaquan Deng, Yongshou Liu, Zijun Zhang, Wei Liu

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Size-dependent vibration and stability of multi-span viscoelastic functionally graded material nanopipes conveying fluid using a hybrid method

Jiaquan Deng, Yongshou Liu[1], Zijun Zhang, Wei Liu

Department of Engineering Mechanics, Northwestern Polytechnical University, Xi'an 710129, PR China

Abstract

Functionally graded materials (FGMs) and fluid-conveying nanopipes may find significant applications in nanotechnology. In this paper, the size-dependent free vibration and stability of multi-span viscoelastic FGM nanopipes conveying fluid are investigated by nonlocal elasticity theory. And a hybrid method which combines reverberation-ray matrix method and wave propagation method is developed to determine the natural frequencies. Present analysis is verified by comparing results with those in existing literature. Then, the effects of fluid velocity, nonlocal parameter, volume fraction exponent and internal damping on stability of multi-span FGM nanopipes conveying fluid are discussed. It is found that the stability decreases with the increase of nonlocal parameter and increases with increasing volume fraction exponent. It is also found that distributions of natural frequencies of FGM nanopipes can be modulated by designing the volume fraction exponent.

Keywords: Size-dependent vibration; Functionally graded materials; Multi-span nanopipes conveying fluid; Nonlocal elasticity theory; Hybrid method

[1]Corresponding author.

E-mail address: yongshouliu@nwpu.edu.cn (Y.S. Liu)