

## Accepted Manuscript

Dynamic response of viscoelastic functionally graded hollow cylinder subjected to thermo-mechanical loads

Ahmad Akbari, Akbar Bagri, Sundararajan Natarajan

PII: S0263-8223(18)31122-X

DOI: <https://doi.org/10.1016/j.compstruct.2018.06.044>

Reference: COST 9838

To appear in: *Composite Structures*



Please cite this article as: Akbari, A., Bagri, A., Natarajan, S., Dynamic response of viscoelastic functionally graded hollow cylinder subjected to thermo-mechanical loads, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.06.044>

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 proof before it is published in its final 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.

# Dynamic response of viscoelastic functionally graded hollow cylinder subjected to thermo-mechanical loads

Ahmad Akbari<sup>a,1</sup>, Akbar Bagri<sup>b</sup>, Sundararajan Natarajan<sup>c</sup>

<sup>a</sup>Department of Mechanical Engineering, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran

<sup>b</sup>Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, USA.

<sup>c</sup>Integrated Modelling and Simulation Lab, Department of Mechanical Engineering, Indian Institute of Technology-Madras, Chennai, India.

---

## Abstract

In this paper, the dynamic response of functionally graded viscoelastic hollow cylinder subjected to thermo-mechanical loads is studied using the meshless local Petrov-Galerkin method. The material is assumed to be graded in the radial direction with aluminum as viscoelastic constituent and alumina as the elastic constituent. The macroscopic viscoelastic properties are evaluated using the rule of mixtures and the inverse rule of mixtures, whilst that of the cylinder is computed by employing the Mori-Tanaka homogenization scheme. A systematic parametric study is carried out to bring out the influence of material gradient index, the viscoelastic properties and the boundary conditions on the dynamic /transient response of the cylinder.

*Keywords:* functionally graded material, viscoelastic, thermal stress, creep and relaxation, dynamic analysis, meshless local Petrov Galerkin method, Houbolt method.

---

## 1. Introduction

Functionally graded materials (FGMs) are macroscopically homogeneous and microscopically heterogeneous materials, wherein, two material with different properties are combined together. Typical constituents are metals and ceramics [1, 2]. The ceramic constituent provides thermal stability and the metal constituent provides structural stability. Unlike the reinforced composite materials, the material properties in the FGMs varies continuously with position, thus eliminating sharp interfaces. Due to this, the FGMs are preferred over other composite materials and find applications in variety of fields, viz., electronic devices, bio-mechanical tools, structural materials and aerospace industries [3–7].

The tunable property of the FGM has attracted researchers to study the static and the dynamic behavior of structures made of FGMs [8–11]. Of different configurations, the plate and shell structures made up of FGMs have been extensively studied in the literature [12–17]. Nami and Eskan-

---

<sup>1</sup>Corresponding author: ahmad.akbari.r@iauksh.ac.ir ; ahmad.akbari.r@gmail.com

Download English Version:

<https://daneshyari.com/en/article/6703146>

Download Persian Version:

<https://daneshyari.com/article/6703146>

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