Title: A study on the modeling of sandwich functionally graded particulate composites

Author(s): **Loja, M. A. R.**[1,2]; **Barbosa, J. I.**[1,2]; Soares, C. M. Mota[2]

Source: Composite Structures

Volume: 94 **Issue:** 7 **Pages:** 2209-2217 **DOI:** 10.1016/j.compstruct.2012.02.015 **Published:** Jun 2012

Document Type: Article

Language: English

Abstract: Dual-phase functionally graded materials are a particular type of composite materials whose properties are tailored to vary continuously, depending on its two constituent's composition distribution, and which use is increasing on the most diverse application fields. These materials are known to provide superior thermal and mechanical performances when compared to the traditional laminated composites, exactly because of this continuous properties variation characteristic, which enables among other advantages smoother stresses distribution profile. In this paper we study the influence of different homogenization schemes, namely the schemes due to Voigt, Hashin-Shtrikman and Mod-Tanaka, which can be used to obtain bounds estimates for the material properties of particulate composite structures. To achieve this goal we also use a set of finite element models based on higher order shear deformation theories and also on first order theory. From the studies carried out, on linear static analyses and on free vibration analyses, it is shown that the bounds estimates are as important as the deformation kinematics basis assumed to analyse these types of multifunctional structures. Concerning to the homogenization schemes studied, it is shown that Mori-Tanaka and Hashin-Shtrikman estimates lead to less conservative results when compared to Voigt rule of mixtures.

Author Keywords: Functionally Graded Materials; Homogenization Schemes; Linear Static Analysis; Free Vibration Analysis; Higher Order Shear Deformation Models

KeyWords Plus: High-Order Theory; Plate Deformation; Prediction; Shells; Beams

Reprint Address: Loja, MAR (reprint author), Inst Super Engn Lisboa, ADEM, IPL, Lisbon, Portugal.

Addresses:
1. Inst Super Engn Lisboa, ADEM, IPL, Lisbon, Portugal
2. Univ Tecn Lisboa, IDMEC LAETA, Inst Super Tecn, P-1100 Lisbon, Portugal

E-mail Address: amelialoja@dem.isel.ipl.pt

Funding:

Funding Agency	Grant Number
FCT	PTDC/EME-PME/120830/2010
FCT/POCI	

Publisher: Elsevier SCI LTD

Publisher Address: The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, Oxon, England

ISSN: 0263-8223

Citation: Loja M A R, Barbosa J I, Soares C M M. A study on the modeling of sandwich functionally graded particulate composites. Composite Structures. 2012; 7 (94): 2209-2217.