# Accepted Manuscript


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PII: S1359-8368(17)30603-0

DOI: 10.1016/j.compositesb.2018.03.023

Reference: JCOMB 5582

To appear in: *Composites Part B*

Received Date: 17 February 2017

Revised Date: 10 January 2018

Accepted Date: 13 March 2018

Please cite this article as: Oktem AS, Adali S, Buckling of shear deformable polymer/clay nanocomposite columns with uncertain material properties by multiscale modeling, *Composites Part B* (2018), doi: 10.1016/j.compositesb.2018.03.023.

# Buckling of shear deformable polymer/clay nanocomposite columns with uncertain material properties by multiscale modelling

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**Abstract**

Buckling of shear deformable columns is studied taking the variations in the material properties into account. The material of the column is specified as a polymer/clay nanocomposite and the properties of the components, i.e., elastic constants of the polymer and clay platelets, are taken as uncertain-but-bounded. The elastic constants of the nanocomposite are determined via a micromechanical approach. The uncertainties in the matrix and the reinforcement propagate to the bending and shear stiffnesses which, in turn, lead to an uncertain buckling load expression. The least favorable value of the buckling load is obtained via convex modeling corresponding to the worst case material properties. The effects of the uncertain material parameters of the polymer/clay nanocomposite on the buckling load are investigated numerically.

*Keywords*: Shear deformable column, polymer/clay nanocomposite, material uncertainty, convex analysis, micromechanics, multiscale analysis.

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## 1. Introduction

Nanocomposites and, in particular, polymer/clay nanocomposites are being used extensively in various advanced applications due to their high strength and stiffness properties [1-3] as well as due to a number of other properties such as high thermal stability [4, 5]. The reinforcements in polymer/clay nanocomposites are clay minerals which are composed of thin platelets with large surface areas and high aspect ratios and they provide efficient reinforcements. Advanced properties