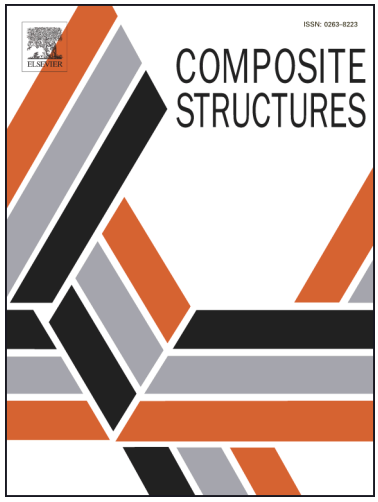


# Buckling analysis of non-uniform thickness nanoplates in an elastic medium using the Isogeometric Analysis

T. Banh-Thien, H. Dang-Trung, L. Le-Anh, V. Ho-Huu, T. Nguyen-Thoi

PII: S0263-8223(16)31460-X
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.11.092
Reference: COST 8053

To appear in: *Composite Structures*

Received Date: 6 August 2016
Revised Date: 25 November 2016
Accepted Date: 30 November 2016

Please cite this article as: Banh-Thien, T., Dang-Trung, H., Le-Anh, L., Ho-Huu, V., Nguyen-Thoi, T., Buckling analysis of non-uniform thickness nanoplates in an elastic medium using the Isogeometric Analysis, *Composite Structures* (2016), doi: http://dx.doi.org/10.1016/j.compstruct.2016.11.092

# Buckling analysis of non-uniform thickness nanoplates in an elastic medium using the Isogeometric Analysis

**T. Banh-Thien, H. Dang-Trung, L. Le-Anh, V. Ho-Huu, T. Nguyen-Thoi***

*Division of Computational Mathematics and Engineering, Institute for Computational Science, Ton Duc Thang University, Vietnam*

*Faculty of Civil Engineering, Ton Duc Thang University, Vietnam*

## Abstract

The paper presents a new numerical approach for buckling analysis of non-uniform thickness nanoplates in an elastic medium using the isogeometric analysis (IGA). By ignoring the van der Waals interaction between two adjacent plates, non-uniform thickness nanoplates are described as a single-layered graphene sheet. The governing differential equation of the nanoplates is derived by the nonlocal theory in which the nonlocal stress-strain relation is used to capture the nonlocal mechanics caused by small size effects. The governing equation is then discretized into algebraic equations and solved by using IGA procedure to determine the critical buckling load. By using the non-uniform rational B-splines, IGA easily satisfies the required continuity of the partial differential equations in buckling analysis. Several numerical examples are solved and compared with those of previous publications to illustrate the performance of IGA for buckling analysis of nanoplates.

***Keywords****: nanoplate; non-local theory; buckling load; isogeometric analysis.*

## 1. Introduction

Since carbon nanotubes (CNTs) were discovered by Iijima [1] in 1991, nanomaterials have attracted a huge amount of attention from the scientific community. Due to their extraordinary mechanical, chemical, thermal, electrical and electronic properties, structures made from nanomaterials such as nanobeams [2], nanorods [3], nanoribbons [4], nanoplates [5], nanoshells [6], etc. have been studied and applied to many engineering disciplines. Their applications as sensors [7], [8], atomic dust detectors [9], enhancer of surface image resolution [10], and so on, have been widely developed in the past few years. Among

* Corresponding author. Tel.: +84 933 666 226.
*E-mail address:* nguyenthoitrung@tdt.edu.vn *(T. Nguyen-Thoi)*