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Nicholas Fantuzzi, Francesco Tornabene, Michele Bacciocchi, Rossana Dimitri

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FREE VIBRATION ANALYSIS OF ARBITRARILY SHAPED FUNCTIONALLY GRADED CARBON NANOTUBE-REINFORCED PLATES**

Nicholas Fantuzzi[1], Francesco Tornabene*[1], Michele Bacciocchi[1], Rossana Dimitri[2]

ABSTRACT. By means of Non-Uniform Rational B-Splines (NURBS) curves, it is possible to describe arbitrary shapes with holes and discontinuities. These peculiar shapes can be taken into account to describe the reference domain of several nanoplates, where a nanoplate refers to a flat structure reinforced with Carbon Nanotubes (CNTs). In the present paper, a micromechanical model based on the agglomeration of these nanoparticles is considered. Indeed, when this kind of reinforcing phase is inserted into a polymeric matrix, CNTs tend to increase their density in some regions. Nevertheless, some nanoparticles can be still scattered within the matrix. The proposed model allows to control the agglomeration by means of two parameters. In this way, several parametric studies are presented to show the influence of this agglomeration on the free vibrations. The considered structures are characterized also by a gradual variation of CNTs along the plate thickness. Thus, the term Functionally Graded Carbon Nanotubes (FG-CNTs) is introduced to specify these plates. Some additional parametric studies are also performed to analyze the effect of a mesh distortion, by considering several geometric and mechanical configurations. The validity of the current methodology is proven through a comparative assessment of our results with those available from the literature or obtained with different numerical approaches, such as the Finite Element Method (FEM). The strong form of the equations governing a plate is solved by means of the Generalized Differential Quadrature (GDQ) method.

KEYWORDS: A. Layered structures, B. Mechanical properties, C. Numerical analysis, C. Computational modelling, Functionally Graded Carbon Nanotubes.

[1] *DICAM - Department, School of Engineering and Architecture, University of Bologna, Italy.*
[2] *Department of Innovation Engineering, University of Salento, Lecce, Italy*
*Corresponding author: Francesco Tornabene, email: francesco.tornabene@unibo.it
web page: http://software.dicam.unibo.it/diqumaspab-project
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