

# Accepted Manuscript

Effects of carbon nanotube inclusion into the carbon fiber reinforced laminated composites on flexural stiffness: A numerical and theoretical study

Hamza Taş, Ibrahim Fadil Soykok



PII: S1359-8368(18)31275-7

DOI: [10.1016/j.compositesb.2018.09.055](https://doi.org/10.1016/j.compositesb.2018.09.055)

Reference: JCOMB 6025

To appear in: *Composites Part B*

Received Date: 24 April 2018

Revised Date: 31 August 2018

Accepted Date: 21 September 2018

Please cite this article as: Taş H, Soykok IF, Effects of carbon nanotube inclusion into the carbon fiber reinforced laminated composites on flexural stiffness: A numerical and theoretical study, *Composites Part B* (2018), doi: <https://doi.org/10.1016/j.compositesb.2018.09.055>.

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.

# Effects of carbon nanotube inclusion into the carbon fiber reinforced laminated composites on flexural stiffness: A numerical and theoretical study

HAMZA TAŞ<sup>1,\*</sup>, İBRAHİM FADİL SOYKOK<sup>2</sup>

<sup>1</sup>*Manisa Celal Bayar University, Hasan Ferdi Turgutlu Faculty of Technology, Department of Mechanical and Manufacturing Engineering, 45400 Turgutlu, Manisa, Turkey*

<sup>2</sup>*Manisa Celal Bayar University, Hasan Ferdi Turgutlu Faculty of Technology, Department of Mechatronics Engineering, 45400 Turgutlu, Manisa, Turkey*

## ABSTRACT

Because of increased usage areas, and advances in characterization of the nanostructured materials, determination of the engineering properties of composites that includes carbon nanotubes has gained importance. It is possible to designate material properties of carbon nanotube based composites theoretically and experimentally. In this study, engineering constants of carbon nanotube based unidirectional carbon fiber reinforced composite lamina determined theoretically with two different approaches. Then, a composite plate whose laminas were stacked up as a  $[0^\circ/+45^\circ/-45^\circ/90^\circ]_s$  layup was built up in ANSYS, ACP Module. Finally, three point bending analyzes were performed separately under concentrated and distributed load. The results showed that there were negligible differences between the engineering constants obtained from two different theoretical approaches. Engineering constants,  $E_1$ ,  $E_2$ ,  $G_{12}$  and  $G_{23}$ , increased as the added carbon nanotube fraction is increased. Besides that, flexural rigidity of composite plate also showed ever-decreasingly increase, as carbon nanotube content is increased. The results of theoretical and numerical bending analyzes exhibited a good agreement with the maximum percentage relative error of 9.1.

**Keywords:** A. Nano-structures, B. Mechanical properties, C. Analytical modelling, C. Finite element analysis (FEA)

---

\* Corresponding author. E-mail: [hamza.tas36@gmail.com](mailto:hamza.tas36@gmail.com), [hamza.tas@cbu.edu.tr](mailto:hamza.tas@cbu.edu.tr)

Tel: +90 236 314 10 10 Fax: +90 236 314 20 20

Download English Version:

<https://daneshyari.com/en/article/11016252>

Download Persian Version:

<https://daneshyari.com/article/11016252>

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