

Numerical Study on Free Vibration Analysis of Detailed and Homogenized Models for FG-CNTRC Beam

Hyeong-Jin Kim¹⁾ and *Jin-Rae Cho²⁾

¹⁾*The International Centre for Advanced Safety Studies (Lloyd's Register Foundation Research Centre of Excellence), Pusan National University, Busan 609-735, Korea*

²⁾*Department of Naval Architecture and Ocean Engineering, Hongik University, Jochiwon, Sejong 339-701, Korea*

²⁾ jrcho@hongik.ac.kr

ABSTRACT

The aim of this study is to investigate the free vibration characteristics of detailed and homogenized models for functionally graded carbon nanotube-reinforced composite (CNTRC) beams, based on finite element method (FEM). In this study, three types of CNTRC beams and boundary conditions are considered with various volume fractions of CNT. Namely, UD (Uniformly Distributed), FG- Λ , and FG-X models, which have single-wall carbon nanotubes (SWCNTs) distributed with a gradient in the thickness direction, are employed and analyzed with simply supported (SS), clamped-clamped (CC), and free-free (FF) boundary conditions. The results of this study are compared to the existing analytical results of the literature in order to validate the developed finite element models.

ACKNOWLEDGEMENT

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (Grant No. NRF-2017R1D1A1B03028879).

REFERENCES

- Ansari, R., Faghih Shojaei, M., Mohammadi, V., Gholami, R. and Sadeghi, F. (2014), "Nonlinear forced vibration analysis of functionally graded carbon nanotube-reinforced composite Timoshenko beams", *Composite Structures*, **113**, 316-327.
- Shen, H-S. and Xiang, Y. (2013) "Nonlinear analysis of nanotube-reinforced composite beams resting on elastic foundations in thermal environments", *Engineering Structures*, **56**, 698-708.
- Saeed, K. and Khan, N. (2012) "Preparation and properties of multiwalled carbon nanotubes/poly (vinylchloride) nanocomposite", In *Proceedings: The 2012 World Congress on Advanced in Civil Environmental, and Material Research (ACEM' 12)*, Seoul, South Korea, August 26-30.