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Effective Elastic Behaviour and Interfacial Stress Fields in Carbon Nanotube-Reinforced Composites by the Fast Multipole Bem

Zheng Xiaoping[1,2], Wang Haitao[2], Xu Jundong[2] and Yao Zhenhan[2]

Summary

In this paper a new boundary element method (BEM) is developed for analyzing mechanical properties of 3D carbon nanotube (CNT)-reinforced composites. The BEM is accelerated by a new version of fast multipole method (FMM) in order to perform large scale simulation of a representative volume element (RVE) containing up to several hundred of randomly distributed carbon nanotubes. Efficiency of the new version fast multipole BEM code is evaluated in comparison with that of conventional BEM solutions. The numerical results are compared with those of other methods and experimental data published in literature and good agreement is observed. The effects of micro-structural parameters, namely the aspect ratio of CNT, their orientation and the volume fraction, on the effective elastic modulus and interfacial stress fields are studied. The numerical results show that the fast multipole BEM is a promising tool for large-scale numerical analysis of overall mechanical properties and micro- structural details in such kind of composites.

[1]Corresponding author. Tel.: +86-10-62796187 Email: zhengxp@tsinghua.edu.cn
[2]Department of Engineering Mechanics, Tsinghua University, Beijing, 100084, China