

Accepted Manuscript

Finite element analysis of boron nitride nanotubes' effects on the stress intensity factor of a semi-circular surface crack in a wide range of matrixes using RVE model

Davar Ali, Sadri Sen



PII: S1359-8368(16)31675-4

DOI: [10.1016/j.compositesb.2016.11.017](https://doi.org/10.1016/j.compositesb.2016.11.017)

Reference: JCOMB 4705

To appear in: *Composites Part B*

Received Date: 19 August 2016

Revised Date: 4 November 2016

Accepted Date: 8 November 2016

Please cite this article as: Ali D, Sen S, Finite element analysis of boron nitride nanotubes' effects on the stress intensity factor of a semi-circular surface crack in a wide range of matrixes using RVE model, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.11.017.

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.

Finite element analysis of boron nitride nanotubes' shielding effect on the stress intensity factor of semielliptical surface crack in a wide range of matrixes using RVE model

Davar Ali, Sadri Sen

Ataturk University, Faculty of Engineering, Department of Mechanical Engineering,
Erzurum, Turkey

Corresponding author: Davar Ali. Tel.: +90 442 231 4852. E-mail address:

daverali@atauni.edu.tr

ABSTRACT

In terms of fracture toughening mechanisms, this study carried out a finite element analysis to determine the shielding effect of boron nitride nanotubes (BNNTs), as a reinforcement element, on a preexisting semielliptical surface crack in both soft (polymeric) and stiff (ceramic and metal) materials. The BNNTs were distributed randomly using the random sequential adsorption algorithm in the hypothetical matrixes. The prepared representative volume elements (RVEs) contained 2%, 5%, and 8% volume fractions of BNNTs. The elastic modulus ratio of BNNTs to the RVEs matrixes' elastic modulus was set for 11 levels as 1, 5, 10, 20, 40, 100, 200, 500, 1000, 5000 and 10000. Then, semielliptical cracks at the crack depth to crack width ratio of 0.2, 0.4, 0.6 and 1 were embedded on the RVEs' surface to evaluate the mode I stress intensity factor, or K_I value. The results showed that a higher mismatch difference between the matrix and BNNTs' elastic modulus caused further reduction in K_I value. Moreover, in softer materials, the BNNTs' volume fraction changes were more effective

Download English Version:

<https://daneshyari.com/en/article/5021859>

Download Persian Version:

<https://daneshyari.com/article/5021859>

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