

ABSTRACT

Composite material elastic behaviour has been studied using many approaches, all of which are based on the concept of a Representative Volume Element (RVE). The last few decades have seen tremendous development in the use of heterogeneous materials which may be tailored to give good mechanical properties (like high stiffness and low weight) or may be designed to satisfy several technological purposes. Analysis of heterogeneous media, with rapidly oscillating material coefficients, is computationally intense and complex. Thus many averaging and multi-scale schemes have been developed to analyze the composite materials at the macroscopic and microscopic levels, each of which may predict different results upon the assumptions made. The type of averaging will influence the quality of the computed solution quantities. Among all the methods, it was shown that homogenization techniques predict the results more accurately.

The present work is an attempt towards predicting the effective stiffness values of the three dimensional composites for both the damaged and undamaged cases with respect to the desired solution quantities using the method of homogenization. It has been shown that how the damaged cases vary for different fiber-volume fractions, for different crack modes and size of the crack.