A NEW NUMERICAL METHOD FOR DETERMINATION OF EFFECTIVE ELASTIC CONSTANTS IN A COMPOSITE WITH 3D ORTHOGONAL NONWOVEN FIBERS

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The present approach is devoted to the research of the effective characteristics of 3D orthogonal nonwoven fibers composites. Research on determination of effective elastic constants for anisotropic materials is very important in composite structures. A orthogonal nonwoven fibers reinforced resin matrix composites are used in some structural applications, due to their various reasons especially to their excellent mechanical behavior in terms of their specific stiffness in the direction of the fibers. The results were received via ANSYS software package. In this research a volume element of fibers in cubic unit cell is considered (Fig. 1). The effective elastic properties of fiber reinforced composite have been defined by the numerical stress analysis of the unit cell. Stress analysis is performed for considered volume with noting to boundary conditions.

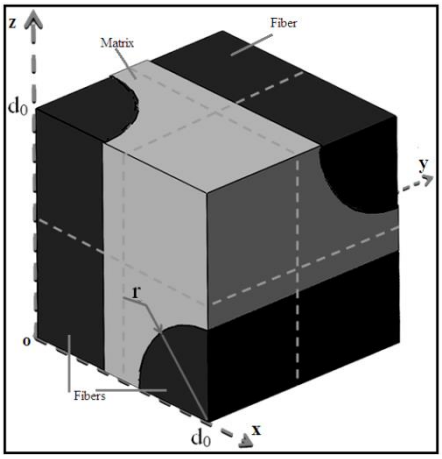

Fig. 1. Representative unit cell model

In the present procedure, normal strain is applied to one direction and shear strain is applied to one plane as follows. Minimum requirement unit cells have been defined for different types of reinforcement as well as the boundary conditions for them, which enable composite behavior modelling under basic experiments conditions. The procedure of finding effective elastic constants for reinforced composites allows receiving results with the reasonable degree of accuracy for practical application. Apart from effective elastic constants finding, the advantage of the developed procedure is the ability to investigate local stress concentration in the unit cell area.