FINITE ELEMENT ANALYSIS OF WEFT KNITTED COMPOSITES

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Knitted fabric reinforced composites shows attractive properties - good impact resistance and high energy absorption, simultaneously high reinforcement deformability makes it possible to fit various complex preform shapes without forming folds (Miravete, 1999). At the same time, mechanical properties prediction for such composite materials still needs additional investigations.

In the present paper mechanical properties of knitted fiber reinforced polymer laminates are investigated numerically and experimentally. Unspecialized FEA software was used for composites material structural behavior simulation. Layered plates reinforced by knitted fabrics mechanical properties were studied numerically investigating material unit cell deformations under applied loads. This model was used in the tensile behavior simulation of epoxy matrix E-glass knitted fabric laminated composites. Numerical results comparison with performed experiments has shown the ability to predict the material properties with reasonable accuracy. Only material properties of constituent fiber and matrix as well as fabric geometric parameters are necessary for building the unit cell. Geometry of the material unit cell was described using Leaf and Glaskin formulas (Huang et al., 2001; Ramakrishna et al., 2000).

Material tensile properties in two principal directions were investigated both experimentally and numerically. ANSYS commercial software was used for material unit cell modeling. The predicted properties were compared with the experimental results and with the data from previous analysis in SolidWorks program.

References

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