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An Anisotropic Damage Model for the Prediction of the Degradation Behaviour of Novel Textile Reinforced Composites

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Novel textile reinforced composites are very suitable for applications in lightweight structures, since they can resist high mechanical and thermal load. In this paper a phenomenological damage-mechanics-based model for these composites is presented. Damage variables are introduced to describe the evolution of the damage state and as a subsequence the degradation of the material stiffness. Special emphasis is given to the interaction between fibre failure due to fibre stress and matrix failure due to transverse and shear stress. The predictive capability of the presented model is evaluated by carrying out a series of tensile tests using acoustic emission techniques to detect the strength and the failure behaviour of CF/PEEK, GF/RP and CF/RP. The performance of the model strongly depends on the correct determination of the material parameters. Thus, model parameters may be determined either by experimental measurement, by micromechanical models or by crack density studies.

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