Modelling the effect of process-induced anisotropy on the constitutive behavior of chopped fiber composites

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Modelling the effect of process-induced anisotropy on the constitutive behavior of chopped fiber composites

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Abstract

This study aims at understanding the influence of process-induced anisotropy on the mechanical behavior of chopped fiber composites up to the onset of failure. Due to the specific microstructure of these materials – neither laminates nor reinforced plastics – a new specimen geometry must be devised for their characterization. Experimental investigations coupled with full field analyses led to the definition of a geometry that avoids edge effects and minimizes strain heterogeneity along the free length. Specimens adopting this geometry were cut out of plates manufactured with a controlled process-induced anisotropy, in different directions. Monotonic and cycled loading paths were applied to these coupons and an elastic-plastic damageable behavior is observed, with little strain rate effects in quasi-statics. Both linear and nonlinear mechanisms display a significant anisotropy, which is found to evolve monotonously with process-induced strains. Simple scalar evolution laws for irreversible strains and loss of stiffness may nevertheless be identified.

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