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Abstract

“Experimental analysis and micromechanical modeling of the viscoelastic behavior of short fiber reinforced polymer composites with fiber-matrix interphase”

In order to improve the mechanical properties of short fiber composites, the fiber-matrix adhesion is decisive and depends strongly on the intersection region between the fiber and the matrix material. However, no perspicuous information about the influence or mechanical properties of the fiber-matrix interphase in short fiber reinforced thermoplastic composites is available. Thus, the present thesis aims for a systematic identification of the geometrical and mechanical impacts of an interphase on the linear-viscoelastic behavior in short glass fiber reinforced thermoplastics. Thereby, the performed investigations are focused on the interaction between micromechanical material modeling and experimental testing. On the one hand, a two-step modeling approach is developed for the realistic description of an entire three phase composite with interphase including anisotropic and linear-viscoelastic effects. On the other hand, the input of this model is provided by different experimental testing methods ranging from the micro- to the macroscale characterization of the composite and matrix material. By comparing these experimental results with the linear-viscoelastic modeling output, the impact of the interphase on the mechanical properties of the composite is accessible. Thus, it is shown that a realistic material modeling and experimental investigations are closely interlinked.