FIBER-REINFORCED ELASTOMERS: A HOMOGENIZATION-BASED CONSTITUTIVE MODEL

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A homogenization-based constitutive model is presented for the mechanical behavior of hyperelastic elastomers reinforced with aligned cylindrical fibers subjected to finite deformations. The model incorporates full dependence on the constitutive behavior of the constituents (i.e., the matrix phase and the fibers). Furthermore, the model accounts for statistical information about the initial microstructure beyond the volume fraction, as well as for its evolution, which results from the finite changes in the geometry that are induced by the applied finite deformations, and can have a softening or hardening effect on the overall response, leading to the possible development of macroscopic instabilities.