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Role of dynamical heterogeneities on the viscoelastic spectrum of polymers: a stochastic continuum mechanics model ROBIN MASUREL, CNRS UPMC ESPCI ParisTech PSL Res Univ, Lab SIMM, SABINE CANTOURNET, MINES ParisTech, PSL-Research University, MAT Centre des matriaux, ALAIN DEQUIDT, Univ Clermont Ferrand, Inst Chim Clermont Ferrand, DIDIER LONG, Laboratoire Polymres et Matriaux Avancs, HELNE MONTES, FRANOIS LEQUEUX, CNRS UPMC ESPCI ParisTech PSL Res Univ, Lab SIMM — Amorphous polymers in their glass transition regime can be described as a tiling of nanometric domains. Each domain exhibits its own relaxation time which is distributed over at least 4 decades. These domains are known as dynamical heterogeneities. This article will describe the mechanics of amorphous polymers using a stochastic continuum mechanics model that includes their heterogeneous dynamics. Solving this model both by finite elements and using a self-consistent method, we find a viscoelastic relaxation spectrum quantitatively similar to that of an experimentally measured one in a polymer. We show evidence that elastic couplings between domains control the stress relaxation after a step strain and result in a narrowing of the long-time region of the viscoelastic spectrum (as compared to that of dynamical heterogeneities).

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