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**Dynamical heterogeneities, shear banding and internal stress in polymer melts** ROBIN MASUREL, PIERRE GELINEAU, CNRS UPMC ESPCI ParisTech PSL Res Univ, SABINE CANTOUNET, MINES ParisTech, PSL-Research University, HLNE MONTES, CNRS UPMC ESPCI ParisTech PSL Res Univ, DIDIER LONG, Laboratoire Polymres et Matriaux Avancs, UMR 5268 CNRS/Solvay, ALAIN DEQUIDT, Univ Clermont Ferrand, FRANCOIS LEQUEUX, CNRS UPMC ESPCI ParisTech PSL Res Univ — As evidenced since about two decades, amorphous polymers present important dynamical heterogeneities at the scale of a few nanometers close in the vicinity of their glass transition. This means that they can be represented as a tiling of nanometric domains, each one with a dynamics very different from its neighbors. We show that these heterogeneities that are known to govern the linear response dynamics, are also responsible for various features of the non-linear mechanical response. For that purpose, we just assume that each domain follows an Eyring law i.e. its relaxation time depends on the stress it undergoes. We show that this simple idea permits to describe the formation of shear bands, the narrowing of relaxation times distribution during loading observed experimentally, and the existence of an unrecoverable elastic energy after unloading. The two last properties are predicted quantitatively without adjustable parameters.

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