

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

What is the structure of a polymer glass after plastic deformation? HELENE MONTES, FRANCOIS LEQUEUX, ESPCI, PPMD, CHRISTIANE ALBA-SIMIONESCO, LCP, Orsay, FREDERIC CASAS, UMR 5254, Pau, PPMD, ESPCI TEAM, LCP, ORSAY TEAM — We aim to study the effect of plastic deformation on the structure of a glassy polymer. Using neutrons scattering on a large range of length scales, and comparing samples deformed below and above T_g , we show that: 1) The deformation is extremely homogeneous (or affine) for length scales above the entanglement distance 2) The crossover length scale between affine and non affine deformation is about half the one of the entanglements, and is independent of temperature below the glass transition 3) The arrangement of the polymer chain is distorted by plastic deformation at the atomic scale We then discuss these results and compare them to the results of the simulation of Hoy and Robbins (J. Polym. Sci., 44 (2006), 3487). As a conclusion we see that the entanglements are responsible for the very homogeneous deformations, forcing the individual plastic events to propagate in the sample following the tension of the chains. Thus we conclude that the physics of the plastic deformation of polymer glasses are very different from the one of other glasses.

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Date submitted: 23 Nov 2007

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