Change from Liquid to gel-type behavior in Side Chain Liquid Crystalline Polymers when approaching the glass transition

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We show that Side Chain Liquid Crystal Polymer melts exhibit a gel-like response when approaching the glass transition on a macroscopic scale (few tens of microns), instead of the conventional flow response. This unexpected result, observed for non-sliding conditions and for very weak imposed strains, results from the percolation of pre-glassy elastic clusters similar to those observed by Fischer et al. by light scattering. The existence of these pre-glassy elastic clusters can be understood by assuming that they are due to long-range density-fluctuations, which appear frozen at the time scale of the experiment. We also show that the percolation effects can be mimicked with a conventional polydimethylsiloxane melt filled with silica particles, the silica particles playing the role of the pre-glassy elastic clusters. The presence of the pre-glassy elastic clusters casts doubt on the widely accepted hypothesis of ergodicity in the supercooled state.