Supporting information

Conformation and Dynamics of Individual Star in Shear Flow and Comparison with Linear and Ring Polymers

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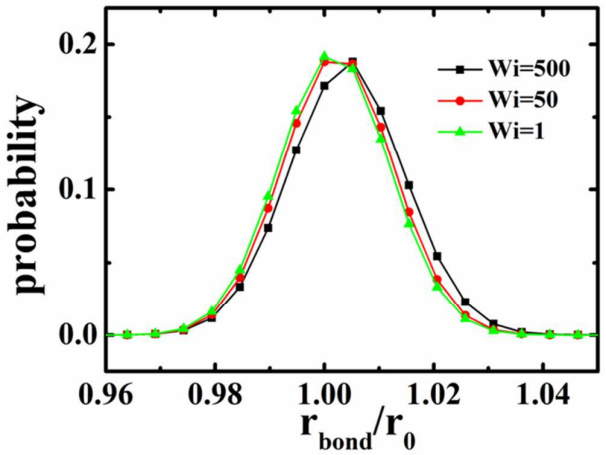

Figure S1. Probability distribution of bond lengths at different shear strains with Wi = 500, 50, 1 for star polymers with f=3 and L_f=20.

In order to gain a deep understanding of the deformation of star polymers under shear flow, the three eigenvalues of the gyration tensor are calculated in our simulations. As shown in Figure S2., for Wi<1, the polymer chains with different architectures have no obvious deformation. With the increase of Weissenberg number, the polymer chains are stretched in the flow direction, companied with shrinking in the shear-gradient and vorticity directions. The deformation of polymer chains can be characterized by the ratio of G_1/G_3. Linear polymers have the largest deformation and highly stretched along the shear flow direction, ring polymers have similar deformation with the star polymer of arms of 3. Star polymers with more arms behave more like spherical colloid, so the deformation decreases. The deformation of the polymer chains with different architectures follows the scaling relationship $G_1/G_3 \sim Wi^{\mu}$ with the exponents of 0.45, 0.47, 0.54 for linear, ring and star (f=10 and Lf=10) polymers, respectively.

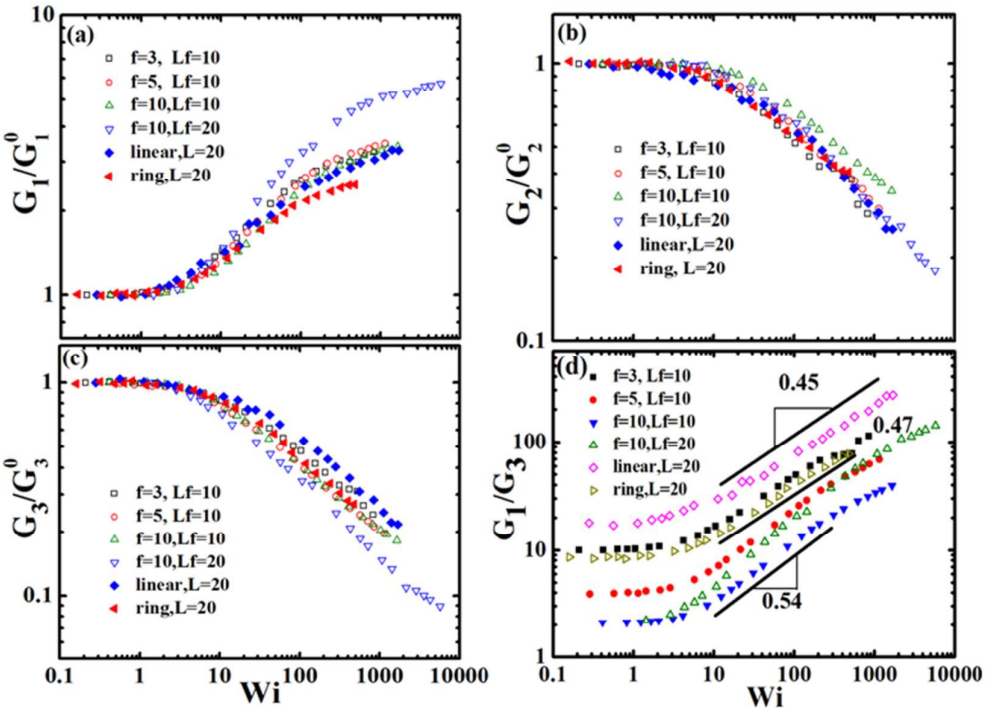

Figure S2. The averaged largest (a) G_1, the intermediate (b) G_2, and the smallest (c) G_3 eigenvalues and (d) the ratio G_1/G_3 as a function of the Weissenberg number Wi for linear, ring and star polymers. G_1^0, G_2^0 and G_3^0 are the eigenvalues in zero-shear state. The solid lines indicate the scaling relationship $G_1/G_3 \sim Wi^{\mu}$ with the exponents of 0.45, 0.47, 0.54 for linear, ring and star (f=10 and Lf=20) polymers, respectively.

Description of Animations

The animations of the dynamics of a star polymer with L_f=10 and f=3 (starf3lf10.mpg), 5 (starf5lf10.mpg) and 10 (starf10lf10.mpg), respectively, in shear flow at the reduced Weissenberg number Wi/f=20.