Supporting Information

Why the Relaxation Times of Polymers from Brillouin Light Spectroscopy are much shorter than the Primary α-Relaxation Times?

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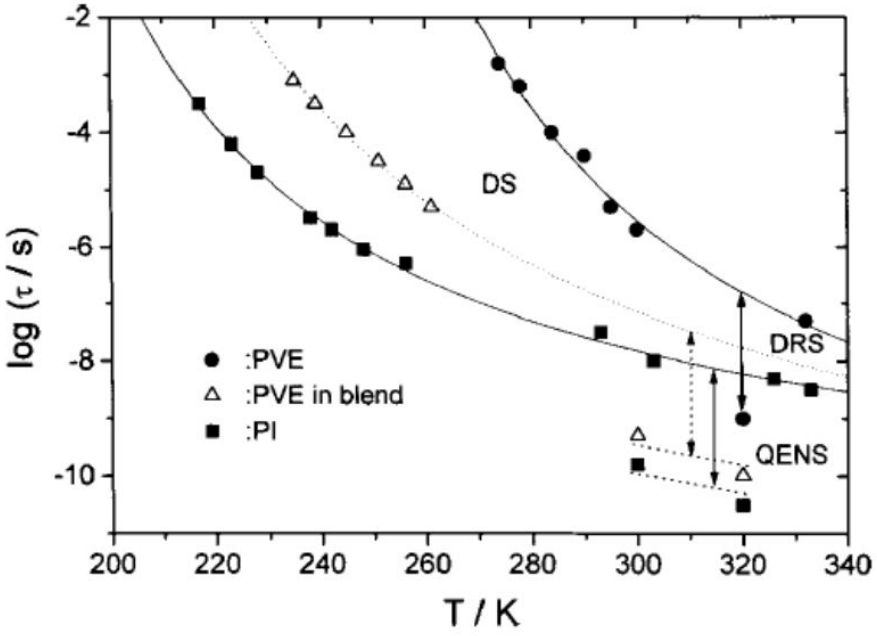

Fig.S1. Relaxation times τ vs temperature T for the homopolymers PI, PVE, and the PVE component in the PI/PVE (70:30) blend. For the homopolymers, τ was obtained from dielectric spectroscopy (DS) at low T, from depolarized Rayleigh spectroscopy (DRS) using tandem. Fabry–Perot interferometry, and from QENS (q=1.53 Å^{-1}) at high T. The solid lines denote fits of the VFTH equation to the data. For the PVE in the blend, the slow τ_s is from QENS at q=1.53 Å^{-1}. The three arrows of equal length denote the vertical shift necessary to match the QENS times with the VFTH lines. The figure is taken from Doxastakis et al.[S1] and reproduced by permission from AIP Publishing.

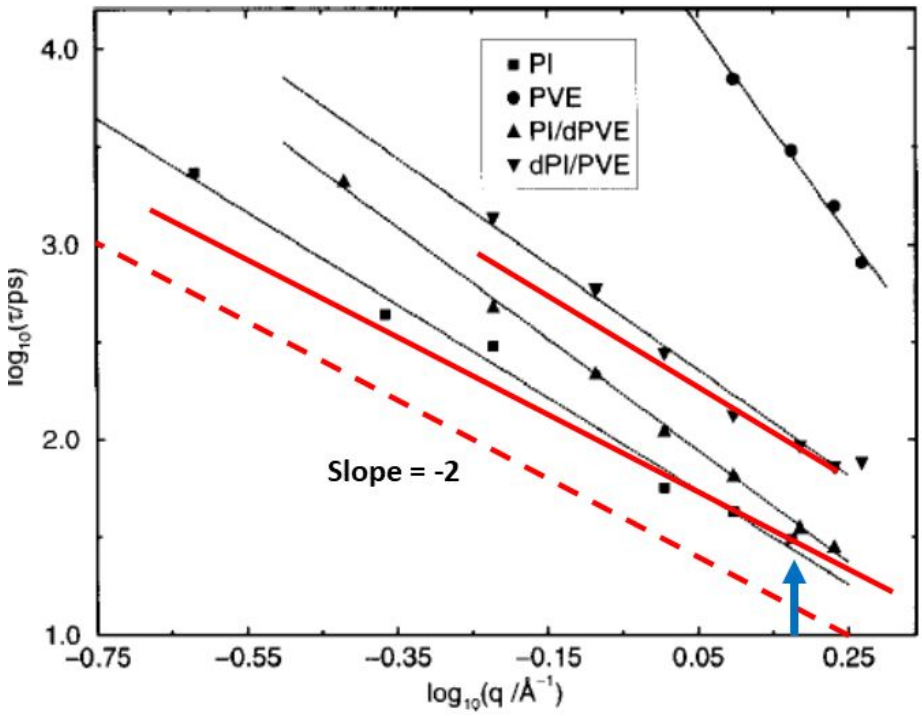

Fig.S2. Relaxation times τ obtained from the KWW representation of the self-correlation function of PI and PVE in the bulk state and in the PI/PVE (70:30) blend at 320 K as a function of the wave vector q. The figure is taken from Doxastakis et al.[S1] and reproduced by permission from AIP Publishing. The blue vertical arrow indicates the location of q=1.53 Å. Added are the red lines all with slope equal to -2, and for PI it is clear that the relaxation time has the q^{-2}-dependence.

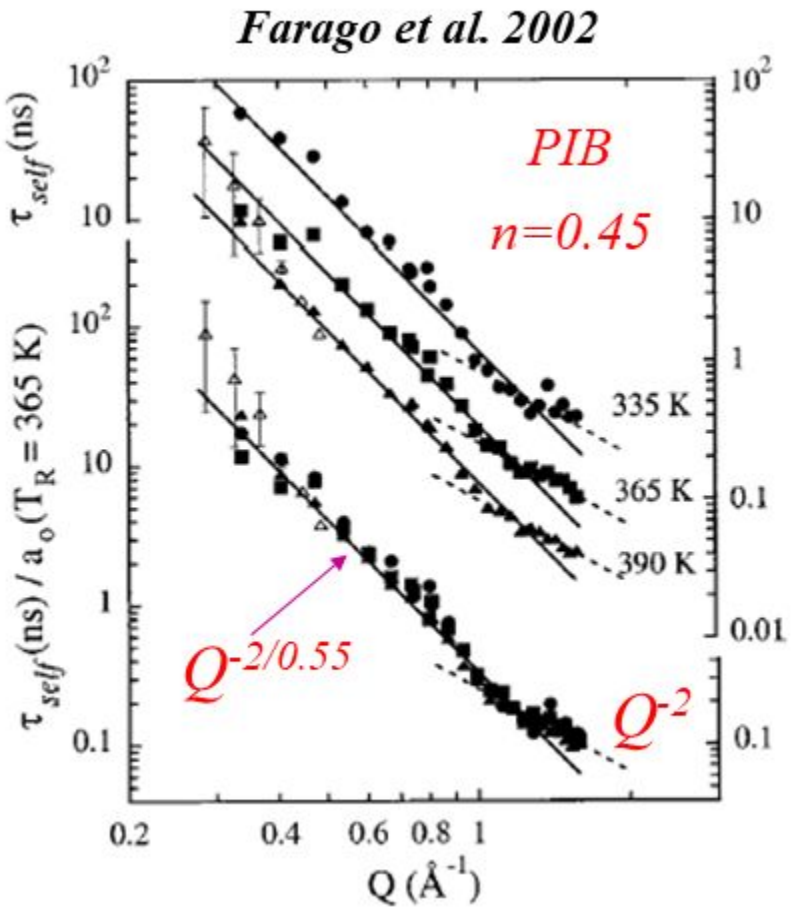

Fig.S3 Upper part: Momentum transfer dependence of the characteristic time of the KWW functions describing the self-correlation function at 335 (circles), 365 (squares), and 390 K (triangles). Lower part: Scaling representation: 335 and 390 K data have been shifted to the reference temperature 365 K applying a shift factor corresponding to an activation energy of 0.43 eV. Full symbols correspond to results from measurements performed with incoming wavelength l56 Å and empty symbols to l510 Å. The solid line and dotted line through the points represent $Q^{-2/0.55}$ and Q^{-2} power laws respectively. The figure is taken from Farago et al.[S2] and reproduced by permission from APS. The information added are all in red.

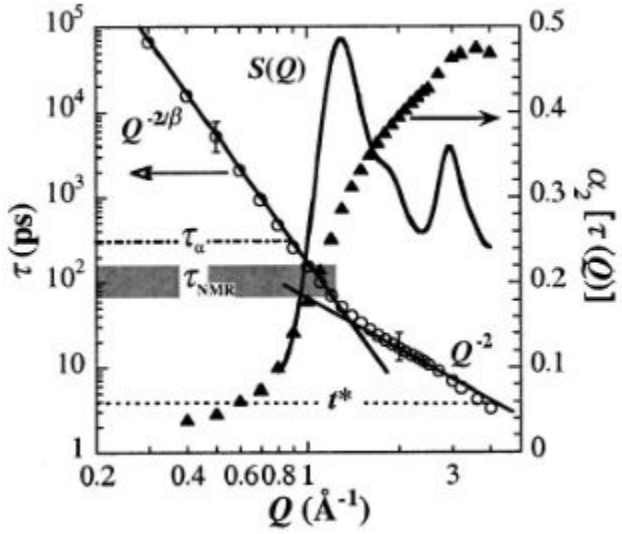

Fig.S4 Momentum transfer Q dependence of the characteristic time $\tau(Q)$ of the α-relaxation obtained from the slow decay of the incoherent intermediate scattering function of the main chain protons (O). The solid lines through the points show the Q dependences of $\tau(Q)$ indicated. The estimated error bars are shown for two Q values. The Q dependence of the value of the non-Gaussian parameter at $\tau(Q)$ is also included (closed triangles) as well as the static structure factor $S(Q)$ on the linear scale in arbitrary units. The horizontal shadowed area marks the range of the characteristic times τ NMR. The values of τ_α and t^* are indicated by the dashed-dotted and dotted lines, respectively. The temperature is 363 K in all cases. Figure is taken from ref.(S3) and reproduced by permission of APS.

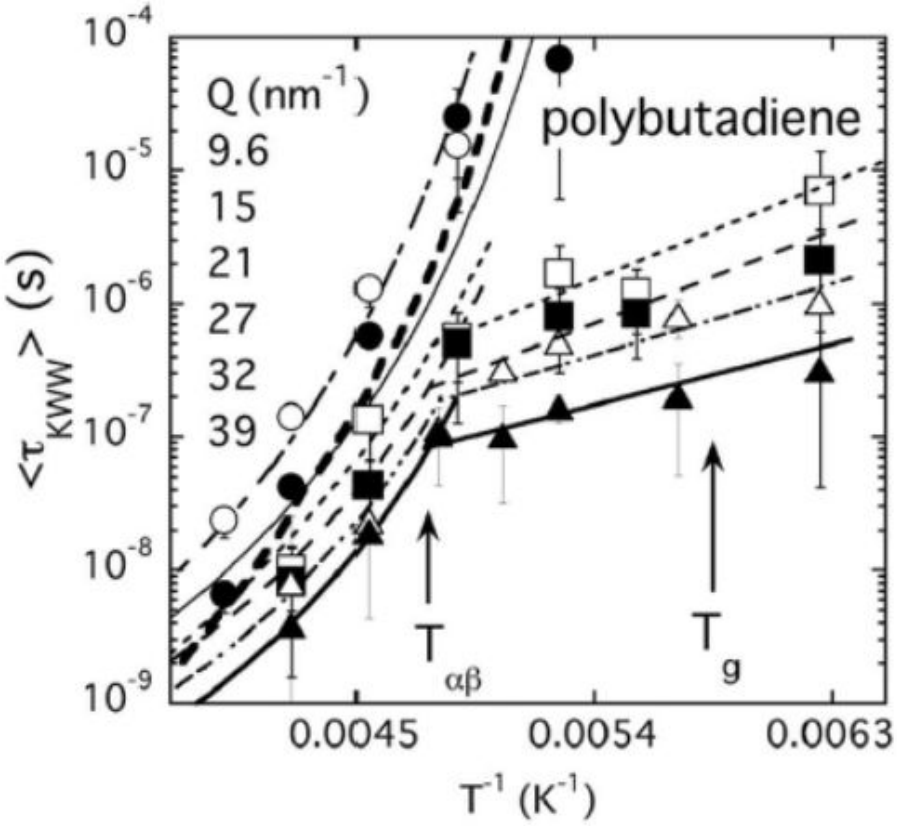

Fig.S5 Temperature dependence of the mean relaxation time (τ_{KWW}) and fitting curves given by symbols and lines, respectively. (a) for PB at Q = 9.6 (o, chain line), 15 (●, thin solid line), 21 (□, dotted line), 27 (closed square, dashed line), 32 (open triangle, two-dotted chain line), and 39 (closed triangle, thick solid thick solid line) nm^{-1}. Figure is taken from Kanaya et al. ref.S4, and reproduced by permission from AIP Publishing

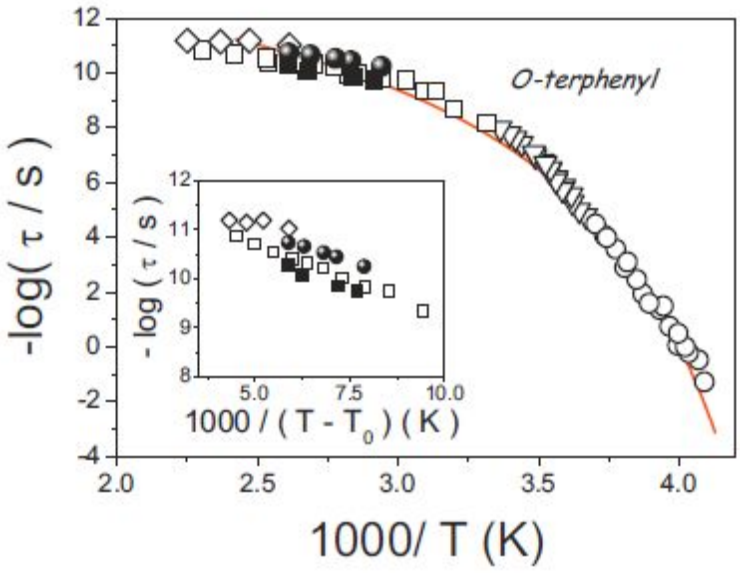

Fig.S6 Arrhenius plot of the different relaxation times associated with the glass formation process in OTP as probed by different experimental techniques in the literature: PCS (circles), BLS (rhombi), DLS (open squares), acoustic measurements (optical heterodyne detected transient grating) (triangles), and from new measurements from ref.13, DLS (filled squares) and BLS (filled circles). The solid line denotes the VFT fit. Inset: an enlarged plot of DLS and BLS times. The figure is taken from Voudouris et al.[S5] and reproduced by permission from AIP Publishing.

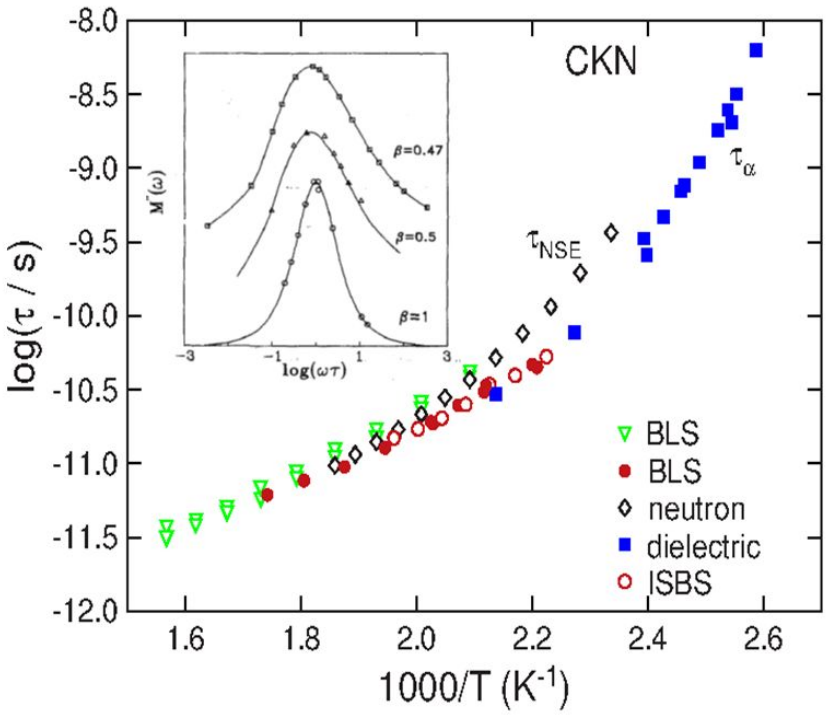

Fig.S7 Various relaxation times of CKN. The inset shows β_K=1 in the BLS regime from ref.(S6). Data in red, blue and black are taken from ref.(S6). Data in green are taken from ref.(S7).

References

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