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Electronic Supplementary Information

Altering surface fluctuations by blending tethered and untethered chains

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Shown in Fig. S1 are correlation function data for the reference sample of pure 2k chains (2k ref 43) at 150 °C, measured in full frame mode. Data are shown for four different values of $q_{||}$ to demonstrate that for sufficiently high $q_{||}$ the baseline has a value of 1.0, as it should. While it appears in the data that for lower values of the $q_{||}$ the correlation functions do not decay to 1.0 at larger times, this is not because there is some relaxation that has not been captured. Instead this is due to some complications in obtaining the correlation functions for low values of $q_{||}$. We have seen this phenomena for several different types of polymer films we have studied. XPCS measurements on thin films are subject to contributions from strong surface scattering that leads to a strong static contribution in the near specular scattering along the q_z direction. While the g_2's are a function of the in-plane wave vector (i.e. q_x and q_y), the contribution to the g_2 at such low values of $q_{||}$ is primarily from the q_x component, which is projected along the q_z direction. As the wave vector increases, the baseline tends to unity as the dynamic scattering becomes dominated by the out-of-scattering plane q_y component rather than the q_x component. This effect has been exploited to study the propagating modes in capillary waves in a mode of XPCS called the "heterodyne mode". [1]

Further, static contrast for the surface reflection can often arise because the intensity varies so quickly over the pixel bins that intensity variations are seen that are comparable to speckle. The g_2 functions at low values of $q_{||}$ are calculated using a 1-2 pixel wide band in q_z. Because of this, the normalization process is not as effective for low values of $q_{||}$.

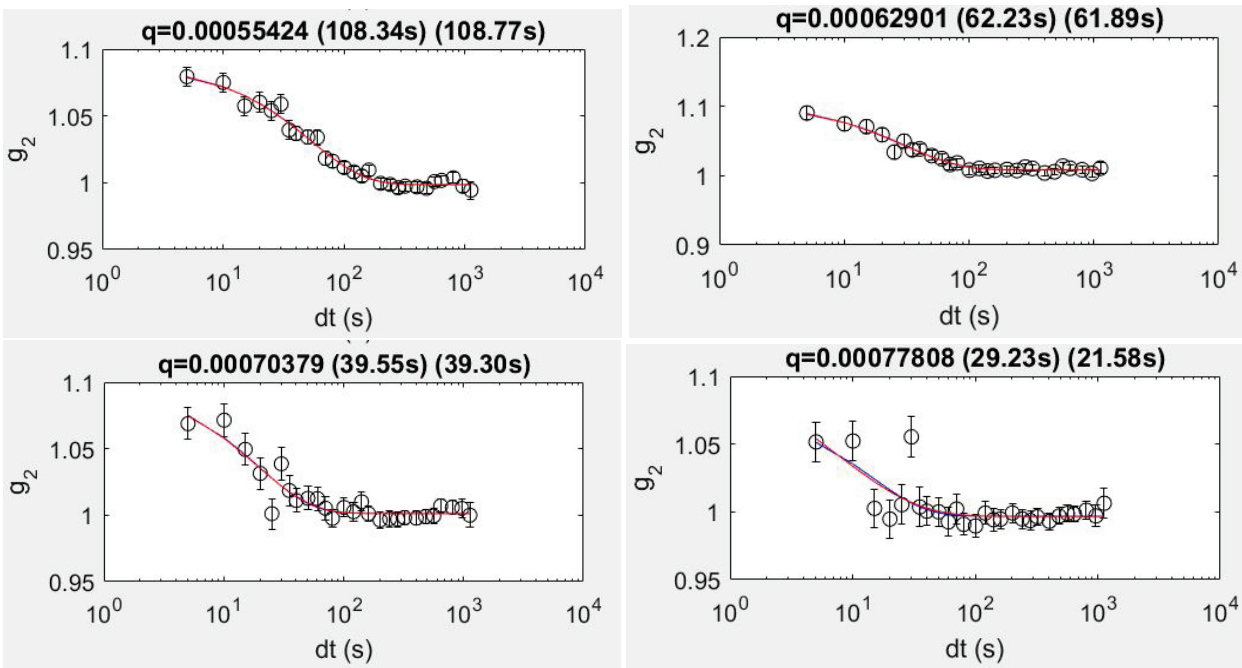

Fig. S1. Time correlation functions for four values of in-plane scattering vector, q, for the reference sample (2k ref 43) of 2k chains at 150 °C. The value of $q_{//}$ is shown in units of $Å^{-1}$. Shown together with the data are fits to two expressions, one a single exponential and the second a stretched exponential. The relaxation times deduced from these fits are shown in seconds in parentheses. When most of the entire relaxation can be seen in the data, the two relaxation times agree well.

References:

1. C. Gutt e*t al.*, *Phys. Rev. Lett.* 2003, **91**, 076104.