Supplementary Materials

PBF Fitting. In order to provide comparable data, in the current work, we also studied the PBF molecular dynamics after slowly cooling from the melt at 3 K/min. We found that the best fit was obtained when using two CC contributions, which is in line with the previous report. In fact, when using only a single CC component, we noticed that not only was the data description the worst, but also that the maximum of the peak and thus the relaxation time did not coincide with that of β_1 for the FC case. We quantified a $\tau(\beta_1)$ of $6.03 \cdot 10^{-5}$ s, which increased to $1.81 \cdot 10^{-4}$ s when using a single CC component. This result is carefully shown in Figure S1.

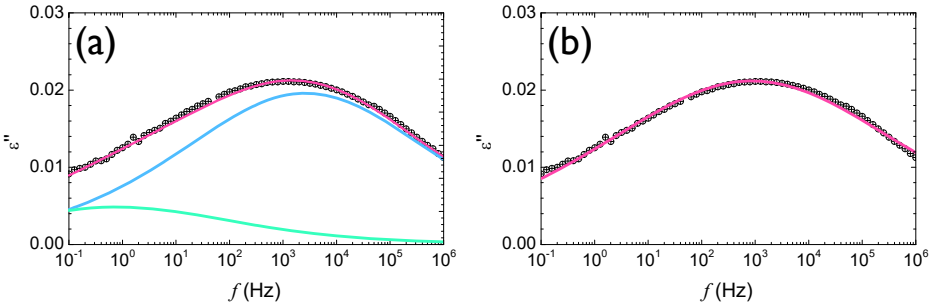

Figure S1. BDS data (points) and fits (lines) for SL PBF. Left panel shows the results using two CC functions and right panel the results using a single CC function.

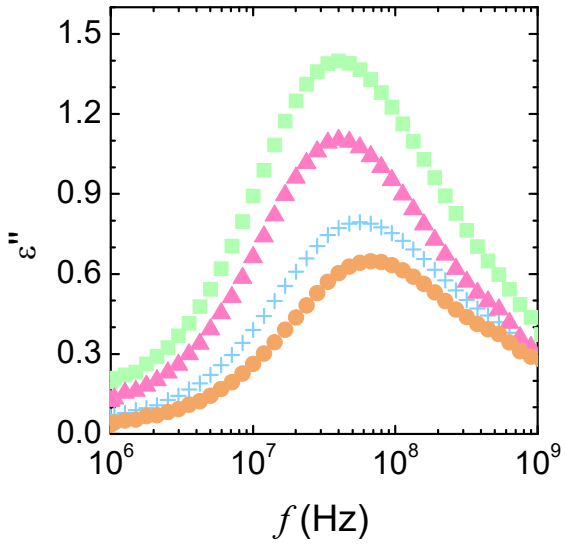

Figure S2. BDS high-frequency data for ■ PTF (438 K), + PBF (428 K), ▲ PPeF (403 K), ● PHF (403 K).