Supplementary Information (SI) for Soft Matter.

Supporting Information
Polymer Dynamics at Low Molecular Weight of Poly(butylene oxide) Star Polymers

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Dielectric Spectroscopy

Temperature Dependence of Dielectric Normal Mode and Segmental Relaxation – Linear PBO

Table S1: Fit parameter for the VFT description of dielectric normal mode and segmental relaxation of linear PBO. See main text for explanation of parameter.

Sample	τ_∞ (s)	A (1/K)	T_0 (K)
Dielectric Normal Mode			
linPBO2.6	$(1.2 \pm 0.1) \cdot 10^{-11}$	1584.3 ± 17.1	144.1 ± 0.5
linPBO4.2	$(5.4 \pm 0.5) \cdot 10^{-11}$	1528.8 ± 21.4	147.5 ± 0.8
linPBO8.5	$(3.0 \pm 0.2) \cdot 10^{-10}$	1547.2 ± 19.8	148.6 ± 0.8
linPBO15.5	$(1.5 \pm 0.1) \cdot 10^{-9}$	1557.7 ± 22.5	149.1 ± 0.9
linPBO23.5	$(6.0 \pm 0.4) \cdot 10^{-9}$	1493.8 ± 18.5	152.2 ± 0.8
linPBO31.5	$(1.9 \pm 0.2) \cdot 10^{-8}$	1439.8 ± 20.5	154.8 ± 0.9
linPBO44.4	$(9.2 \pm 2.1) \cdot 10^{-8}$	1352.9 ± 53.4	158.1 ± 2.2
linPBO51.4	$(1.2 \pm 0.3) \cdot 10^{-7}$	1353.9 ± 59.5	159.5 ± 2.7
linPBO62.4	$(2.1 \pm 0.3) \cdot 10^{-7}$	1370.9 ± 39.9	159.5 ± 1.9
Segmental Relaxation			
linPBO2.6	$(2.6 \pm 0.7) \cdot 10^{-12}$	1016.1 ± 34.4	161.6 ± 1.0
linPBO4.2	$(2.3 \pm 0.5) \cdot 10^{-12}$	1025.1 ± 25.9	163.1 ± 0.7
linPBO8.5	$(2.1 \pm 0.5) \cdot 10^{-12}$	1044.2 ± 28.4	164.1 ± 0.8
linPBO15.5	$(2.3 \pm 0.5) \cdot 10^{-12}$	1036.1 ± 27.4	164.9 ± 0.8
linPBO23.5	$(2.1 \pm 0.5) \cdot 10^{-12}$	1046.9 ± 32.3	165.1 ± 0.9
linPBO31.5	$(1.9 \pm 0.4) \cdot 10^{-12}$	1060.2 ± 25.3	164.6 ± 0.7
linPBO44.4	$(2.4 \pm 0.5) \cdot 10^{-12}$	1029.6 ± 25.4	165.6 ± 0.7
linPBO51.4	$(3.1 \pm 0.7) \cdot 10^{-12}$	998.1 ± 28.8	166.8 ± 0.8
linPBO62.4	$(2.6 \pm 0.6) \cdot 10^{-12}$	1026.5 ± 27.6	165.9 ± 0.8

Temperature Dependence of Dielectric Normal Mode and Segmental Relaxation – Star PBO

Table S2: Fit parameter for the VFT description of dielectric normal mode and segmental relaxation of star PBO. See main text for explanation of parameter.

Sample	τ_∞ (s)	A (1/K)	T_0 (K)
Dielectric Normal Mode			
starPBO3.7	$(4.5 \pm 0.5) \cdot 10^{-11}$	1613.7 ± 23.5	148.8 ± 0.8
starPBO6.7	$(2.2 \pm 0.1) \cdot 10^{-10}$	1583.9 ± 16.6	149.5 ± 0.6
starPBO11.7	$(9.7 \pm 0.8) \cdot 10^{-10}$	1601.7 ± 20.1	148.9 ± 0.8
starPBO19.3	$(5.4 \pm 0.6) \cdot 10^{-9}$	1602.1 ± 28.2	149.6 ± 1.1
Segmental Relaxation			
starPBO3.7	$(2.5 \pm 0.5) \cdot 10^{-12}$	1025.9 ± 26.4	166.3 ± 0.8
starPBO6.7	$(3.2 \pm 0.8) \cdot 10^{-12}$	988.4 ± 30.3	168.1 ± 0.9
starPBO11.7	$(3.2 \pm 0.7) \cdot 10^{-12}$	996.8 ± 27.3	167.3 ± 0.8
starPBO19.3	$(2.8 \pm 0.6) \cdot 10^{-12}$	1010.7 ± 25.4	167.5 ± 0.7

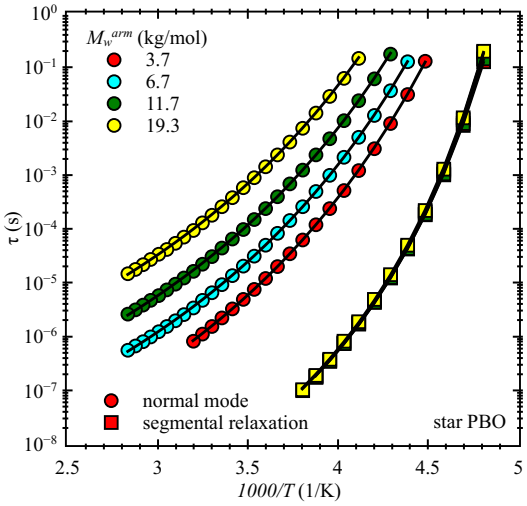
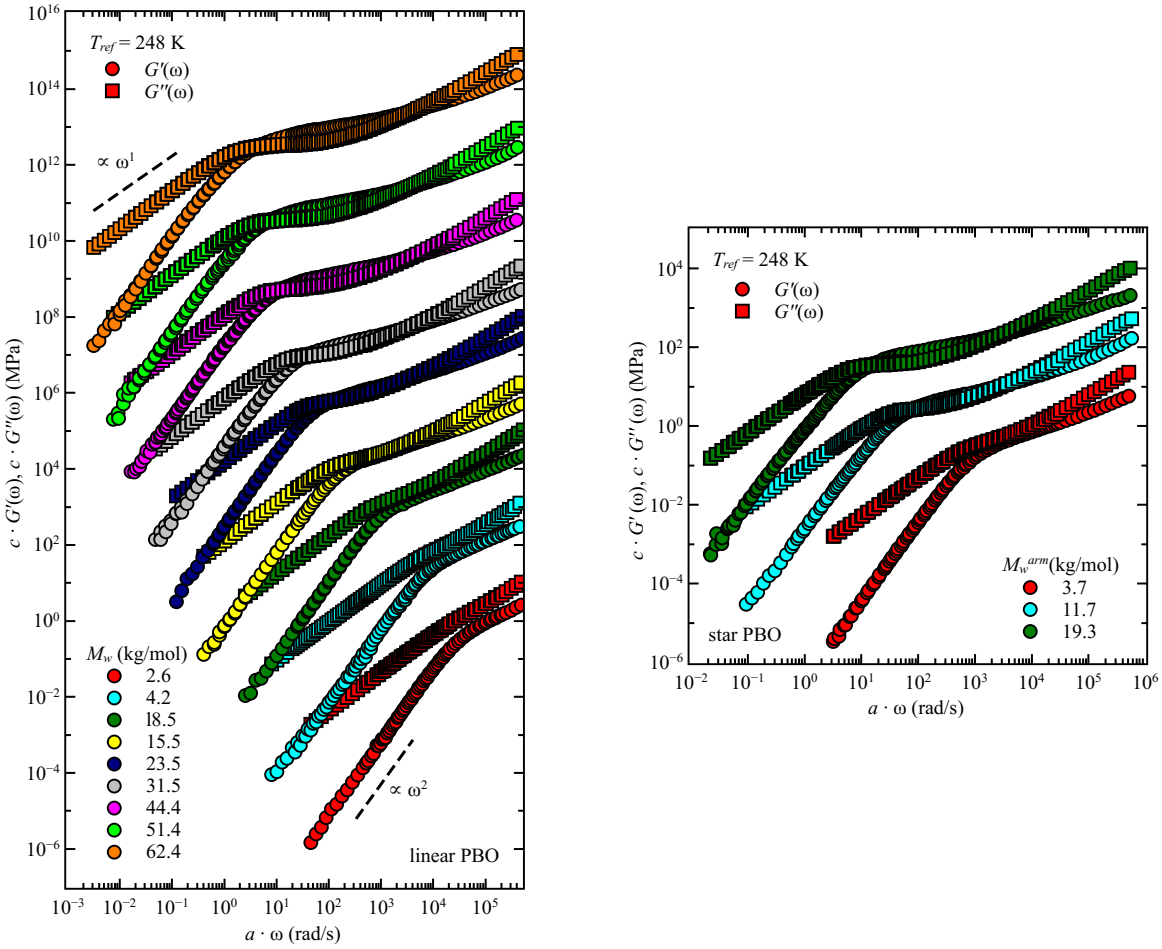


Figure S1: Relaxation time, τ, as a function of $1000/T$ for dielectric normal mode and segmental relaxation of star PBO with different arm molecular weight as indicated. Solid lines are the best description with the VFT equation.

Dynamics Storage and Loss Moduli of Linear PBO and Star PBO



(a) **(b)**

Figure S2: Storage, $G'(\omega)$, and loss, $G''(\omega)$, moduli as a function of frequency, ω, **(a)** linear PBO, and **(b)** star PBO at the reference temperature, $T_{ref} = 248$ K for all the investigated molecular weight as indicated. $G'(\omega)$, and $G''(\omega)$ are shifted vertically by an arbitrary factor, c, for clarity.

Frequency Dependence of Complex Viscosity

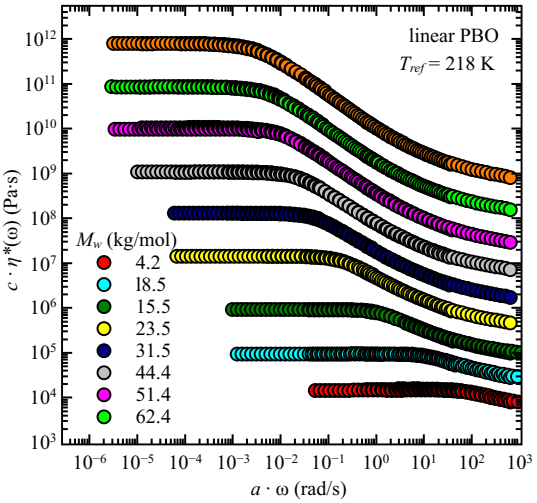
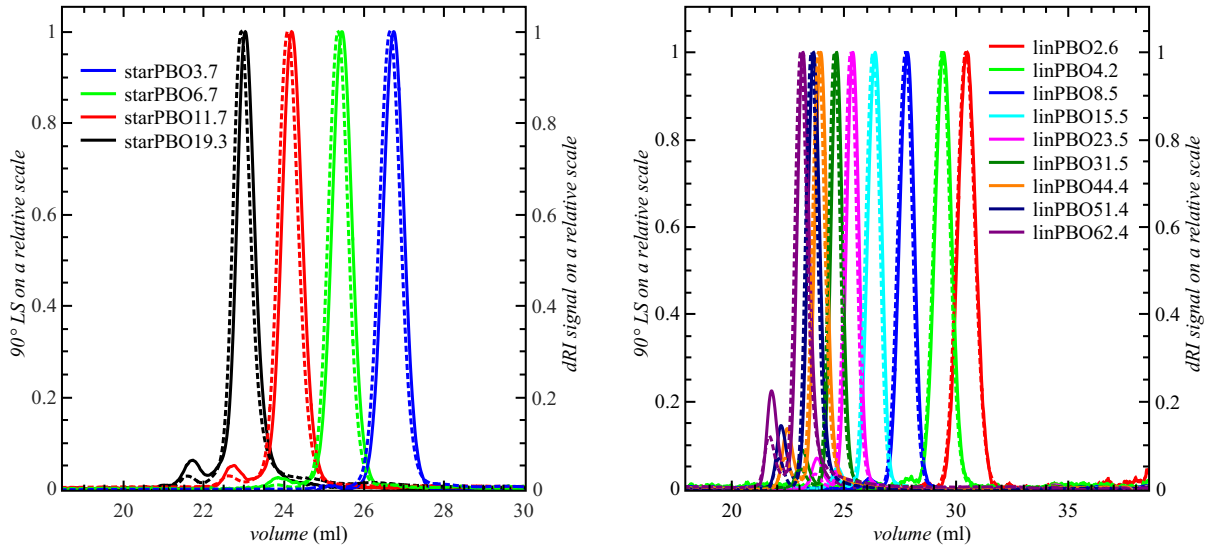


Figure S3: Complex viscosity, η^*, as a function of frequency, ω, for linear PBO with molecular weight M_w as indicated at reference temperature, $T_{ref} = 218$ K

Gel Permeations Chromatography (GPC)



(a) **(b)**

Figure S4: 90° light scattering (LS) signal for the GPC-MALLS chromatogram on a relative scale (solid line), and differential refractive index (dRI) (dotted lines) for **(a)** star PBO and **(b)** linear PBO.