

Electronic Supplementary Information

Structure and Dynamics of Polyrotaxane-based Sliding Graft Copolymers with Alkyl Side Chains

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Estimation of Grafting Density

The side chain grafting density, N (*i.e.*, average number of side chains per CD molecule), was estimated from ^1H NMR spectra (Figure S1). ^1H NMR (400 MHz, CDCl_3 , δ): 0.7–1.3 (methyl and methylene of alkyl side chains), 1.7 (β -methylene of carbonyl), 2.0 (β -methylene of C=C), 2.3 (α -methylene of carbonyl), 3.5–5.0 (H of CD and PEG), 5.3–5.4 (H of vinylene in C18:1-g-PR side chain), 7.26 (CHCl_3). The SGCs did not dissolve well in CHCl_3 and other organic solvents; hence, the ^1H NMR spectra showed broad peaks. For the same reason, valid data for gel permeation chromatography (GPC) were not obtained for several SGCs. The GPC charts for C8-g-PR and C18-g-PR are shown in Figure S2. Values determined for N and molecular weights are summarized in Table S1.

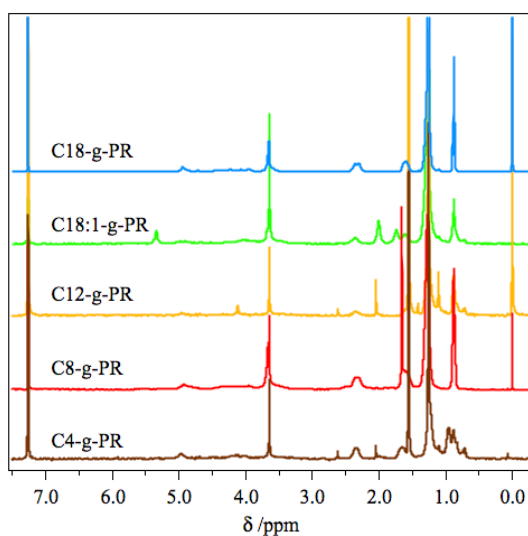


Figure S1: ^1H NMR spectra of SGCs.

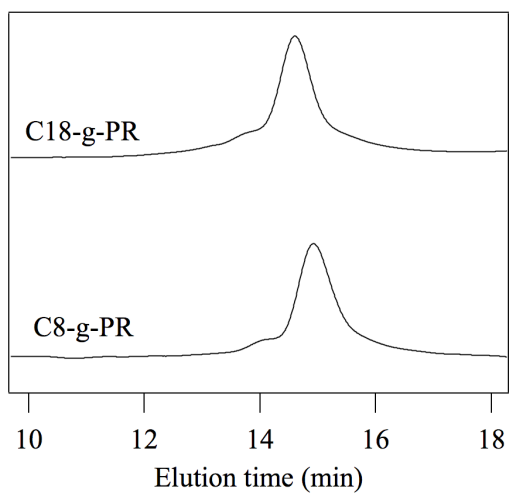


Figure S2: GPC charts of C8-g-PR and C18-g-PR.

Table S1: Average number of side chains per CD molecule, N , and molecular weight.

sample	N	M_w	M_w/M_n
C4-g-PR	14.5	–	–
C8-g-PR	13.2	116,000	1.7
C12-g-PR	9.6	–	–
C18:1-g-PR	6.2	–	–
C18-g-PR	8.2	164,000	1.3

Viscoelastic spectra of C18-g-PR measured above the melting point

Figure S3 shows the master curve of storage (G') and loss (G'') modulus of C18-g-PR measured above the melting point (60–110°C). The measurement was conducted using Rheosol-G5000 (UBM, Kyoto, Japan) in cone and plate geometry at amplitude of 1°. The behavior was almost the same as typical melt polymers; G' and G'' were proportional to ω^2 and ω , respectively. Clear relaxation behavior was not observed in the spectra.

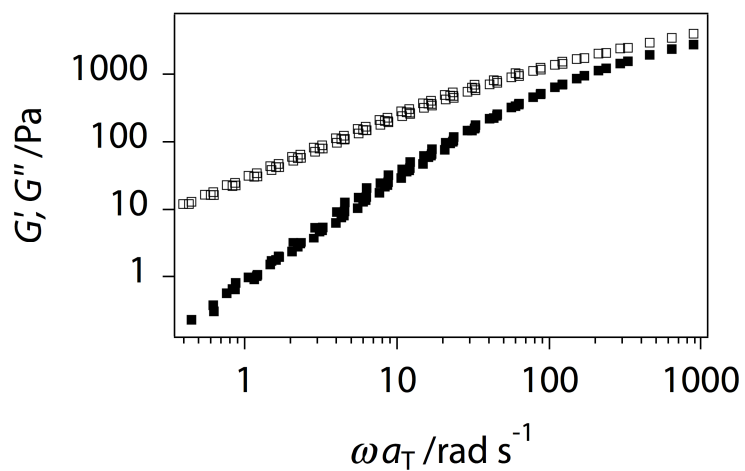


Figure S3: Master curve of storage and loss modulus of C18-g-PR.

Spectra of $\tan \delta$

The spectra of $\tan \delta$ corresponding to Figure 9 are shown in Figure S4.

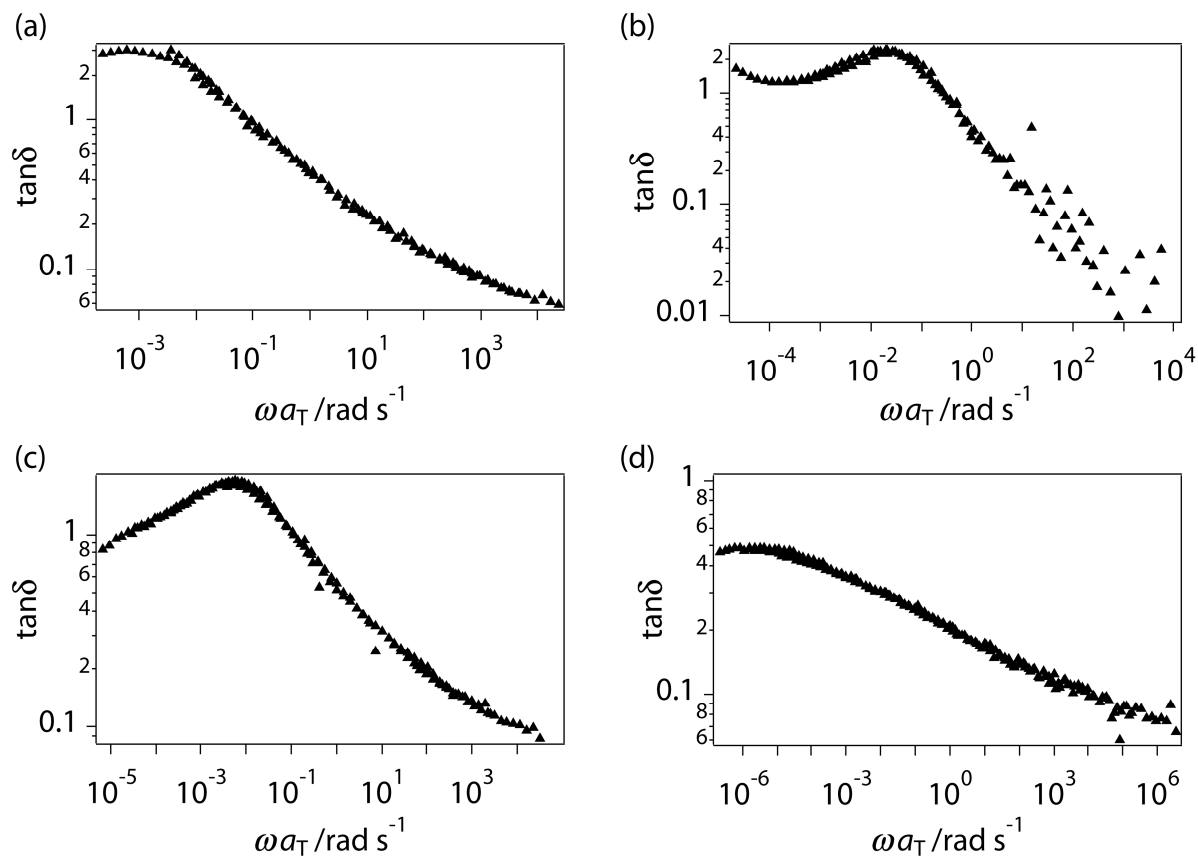


Figure S4: Master curves of $\tan \delta$ corresponding to Figure 9. (a) C4-g-PR ($T_0 = 50^\circ\text{C}$), (b) C8-g-PR ($T_0 = 10^\circ\text{C}$), (c) C12-g-PR ($T_0 = 50^\circ\text{C}$), and (d) C18:1-g-PR ($T_0 = 60^\circ\text{C}$).