Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information for:

Probing Rheological Properties of Supported Thin Polystyrene Films by Investigating the Growth Dynamics of Wetting Ridges

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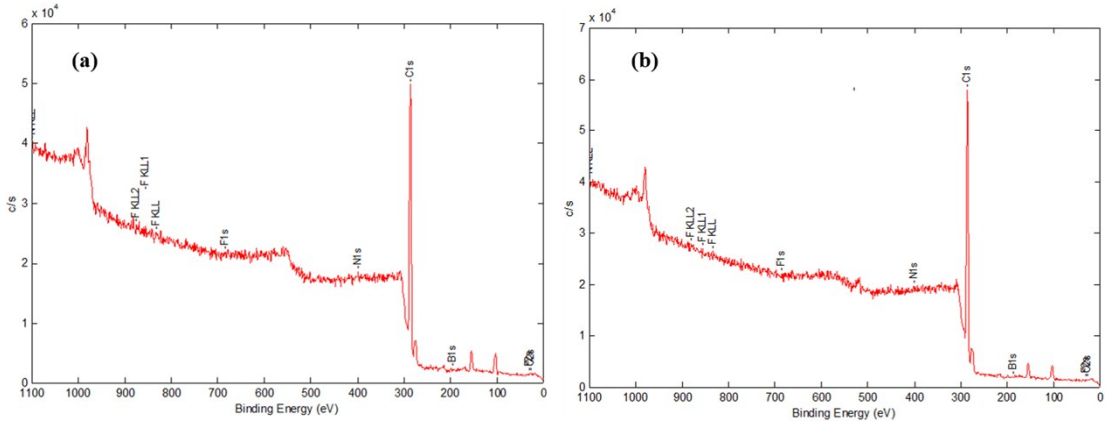

Figure S1. XPS spectrum of the surface of PS films (500 nm) immersed in hot ionic liquid at 453 K for 1 hour. (a): $[EIm]BF_4$ (b): $[HIm]BF_4$. There were no F\B\N elements which was unique to the ionic liquid found on the surface of the PS films.

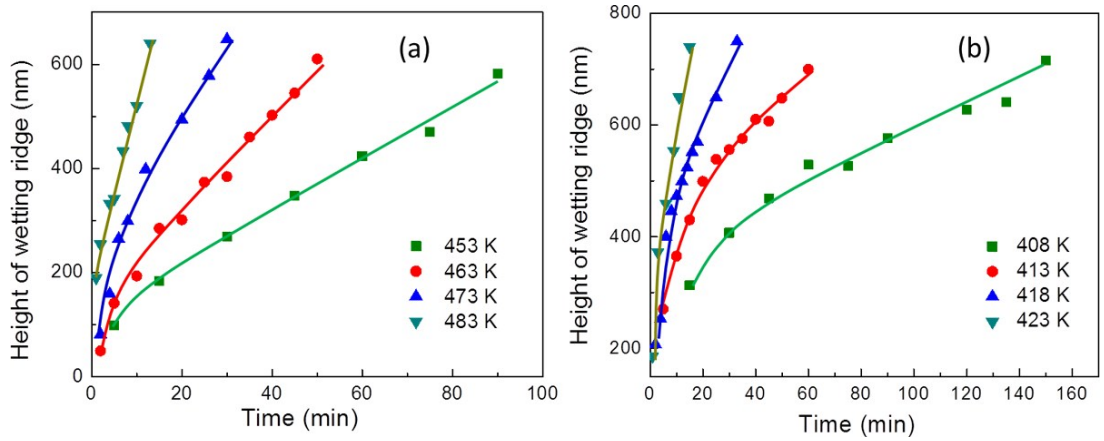

Figure S2. Plot of height of wetting ridge *vs.* droplet deposition time for PS films at different experimental temperatures, when $[HIm]BF_4$ was selected as test liquid. (a) M_w = 1070 kg/mol (b) M_w = 168kg/mol. The curves are the fitted results with the *quasi-creep* equation (*eq.* 1 in manuscript).

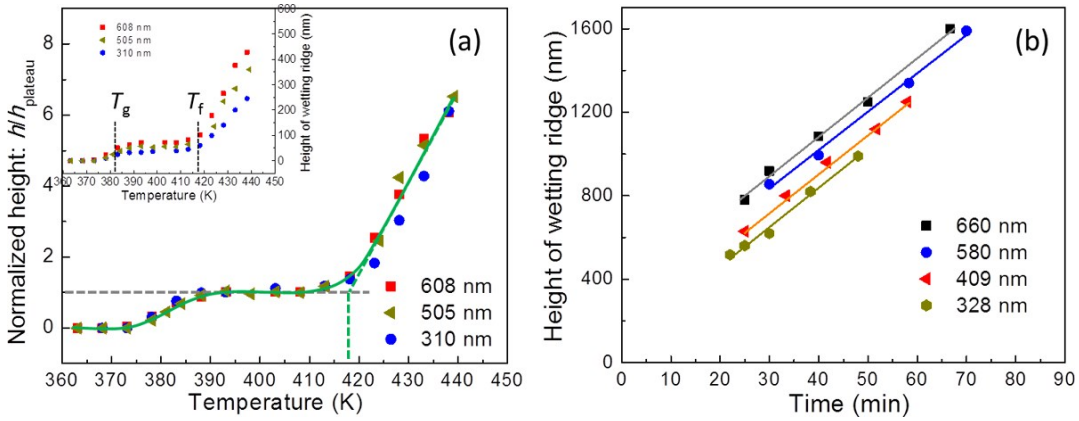

Figure S3. (a) Normalized height of wetting ridge ($h/h_{plateau}$) as functions of temperature for the PS film with various thicknesses (i.e. 310 nm, 505 nm, 608 nm). $h_{plateau}$ represents the wetting ridge height at the rubbery plateau region. Inset shows the raw data of the height of wetting ridge at various temperatures. (b) Height of wetting ridge (h) as functions of droplet deposition time (t) for the PS film with various thicknesses (i.e. 328 nm, 409 nm, 580 nm, 660 nm). M_w = 442 kg/mol.

Inset of Figure S3 (a) displays the changes of the height of wetting ridge with temperature. It was shown that the temperature range of the five regions in polymer viscoelasticity remain the same, despite the height reduced with the decrement of the film thickness. The transition points (T_g, T_f) and the length of the plateau region are insensitive to the PS film thickness. To facilitate comparisons and eliminate the thickness effect, the height of wetting ridge was normalized by the plateau value, and the resultant data are presented in Figure S3 (a). It can be seen that all the $h/h_{plateau}$ *vs.* T curves almost completely overlapped over the wide temperature range. This result demonstrates that the thickness effect does not affect the measurement results, thus was negligible in our measurement.

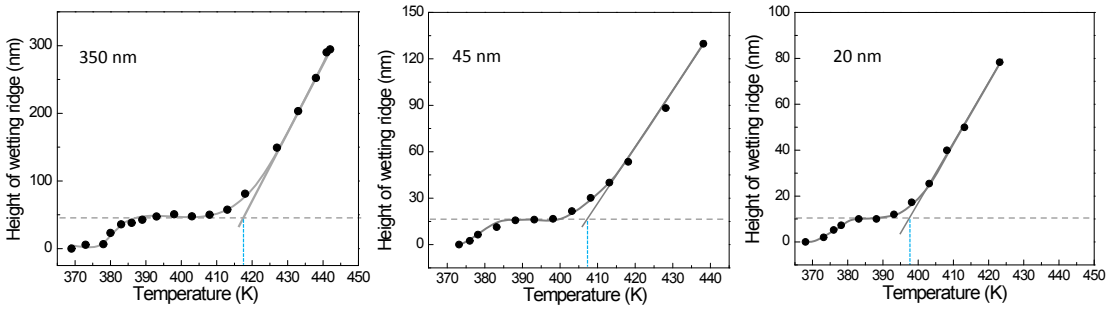

Figure S4. Height of wetting ridge as functions of temperature for the PS film with thicknesses of 350 nm, 45 nm, 20 nm. M_w = 442 kg/mol.