“Reptational” Movements of Single Synthetic Polymer Chains on Substrate Observed by In-situ Atomic Force Microscopy

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Supporting movies are fast forwarded in order to clearly visualize slow movements of the chains. Readers are strongly recommended to watch them in the repeated replay mode in their viewer.

Caption for Supporting Movies

Movie S1. Movie of it-PMMA chains on mica from 0 to 82.5 minutes in 71 %RH and from 82.5 to 136.5 min in 54%RH; each image/2.84 min. The left image is the original AFM image with the center-of-mass trajectories of the chains (blue line: 71% RH, red line: 54% RH). Scale: 484 x 533 nm. The right image is in the 3D mode which is the same as Fig. 1B. The conditions are the same as in Fig. 1.
**Movie S2.** Movie of it-PMMA chains on mica from 0 to 44.8 minutes in 34%RH; each image/2.84 min. The left image is the original AFM image; the right is the 3D image where the substrate surface is tilted 25 degrees around the vertical axis. The arrow indicates movements of a loop along the chain. The conditions are the same as in Fig. 3.

**Movie S3.** Movie of it-PMMA on mica from 0 to 107.9 minutes; each image/2.84 min. This is the same experiment as Movie S1 (Fig. 1). The location of the chain is just beneath the area of Movie S1 (Fig. 1). Scale: 213 x 143 nm. The arrows show the scan directions of each image. There is no difference between the trace and retrace images, and the movements of the chain are not affected by any scan directions; this is the same case for Movies S1 and S2.

**Movie S4.** Movie of it-PMMA on mica from 0 to 173 minutes; each image/8.5 min with 8.5 min intervals at 5% RH. The atmosphere was dried by phosphorus(V) oxide. Scale: 210 x 239 nm. Height range: 1.4 nm.

**Movie S5.** Movie of it-PMMA on mica from 0 to 108.2 minutes observed at 39% RH by non-contact AFM (frequency modulation detection method); each image/4.15 min. Scale: 136 x 214 nm. Height range: 1.9 nm. The images were taken by a commercial AFM, JSPM-5200 (JEOL, Akishima, Japan) with a silicon cantilever (resonance frequency: ca. 160 kHz, spring constant: ca. 4.5 N/m).