Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

Bimodal Frequency-Modulated Atomic Force Microscopy with Small Cantilevers

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Influence of the tip velocity on the image quality. Figs. S1 and S2 show the surface structure of an unetched elastomeric polypropylene sample with a defect area exposing well-aligned crystalline lamellae (round area in the lower part of the image). The structure was imaged with an increasing scan rate and the influence on the image quality was tested. The imaging parameters were optimized for the initial tip velocity of 100 nm/s (0.2 Hz) and kept constant. It could be demonstrated that even at tip velocities of 6.5 µm/s (13 Hz, total image acquisition time 20 s) the topography of the sample was properly traced and both PLLs locked at all time. The crystalline structure within the defect area, however, could not be resolved anymore in the second eigenmode frequency shift image.

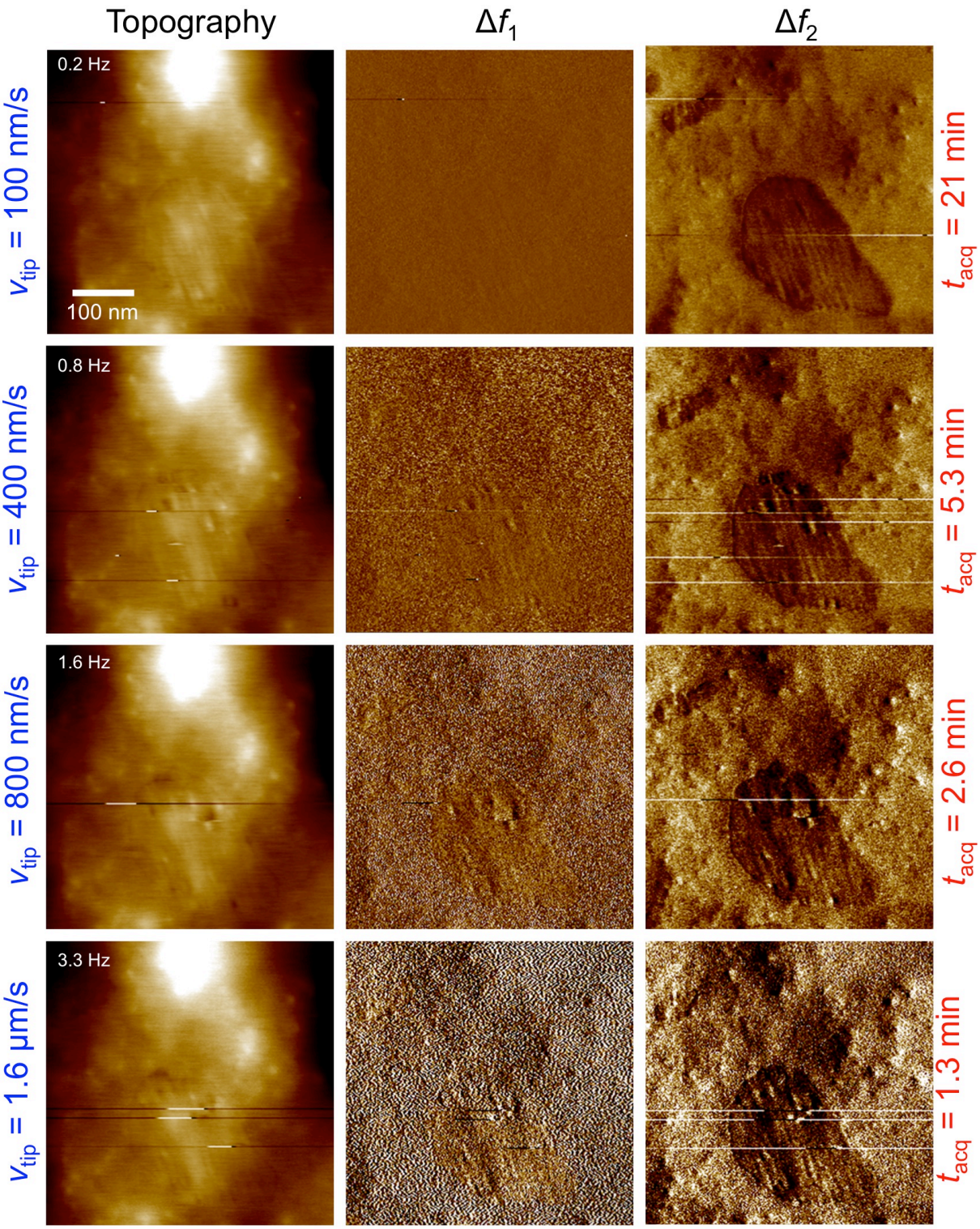

Fig. S1 Topography (left column) and frequency shift images of the first (middle column) and second eigenmode (right column) acquired at different scan rates (0.2 Hz, 0.8 Hz, 1.6 Hz and 3.3 Hz from top to bottom) of an unetched elastomeric polyproplene sample. The image resolution is 256 x 256 pixel at a scan size of (500 x 500) nm^2. The tip velocities and the total image acquisition time are labelled at the left and right side, respectively. Color bars: topography 0 – 14 nm, -321 Hz $\leq \Delta f_1 \leq$ -249 Hz, -161 Hz $\leq \Delta f_2 \leq$ -156 Hz.

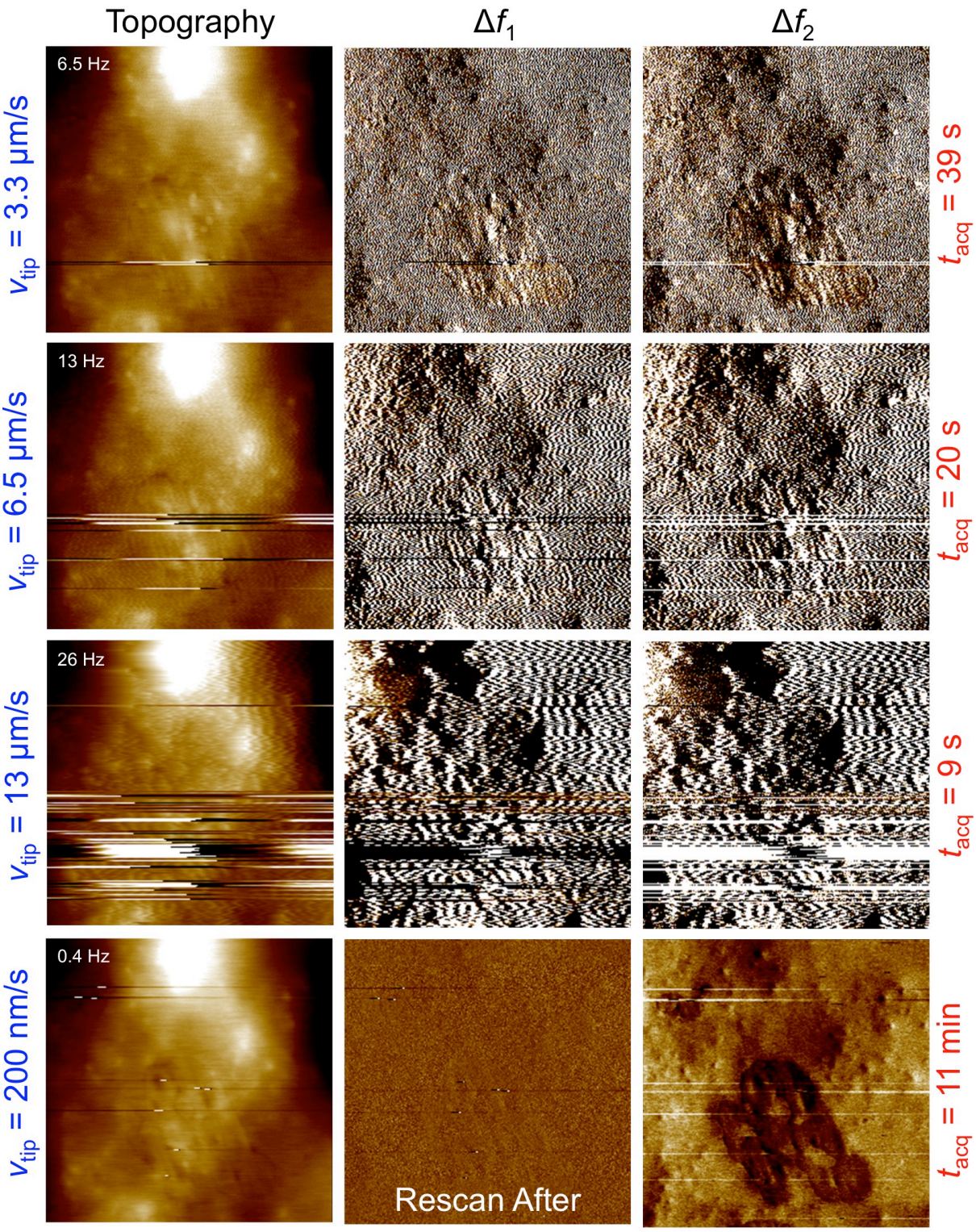

Fig. S2 Topography (left column) and frequency shift images of the first (middle column) and second eigenmode (right column) acquired at different scan rates (6.5 Hz, 13 Hz, 26 Hz and 0.4 Hz from top to bottom) of an unetched elastomeric polyproplene sample. The images in the bottom row is a slow rescan of the same area revealing tip-sample wear due to the high tip velocity. Color bars: topography 0 – 14 nm, -321 Hz $\leq \Delta f_1 \leq$ -249 Hz, -161 Hz $\leq \Delta f_2 \leq$ -156 Hz.