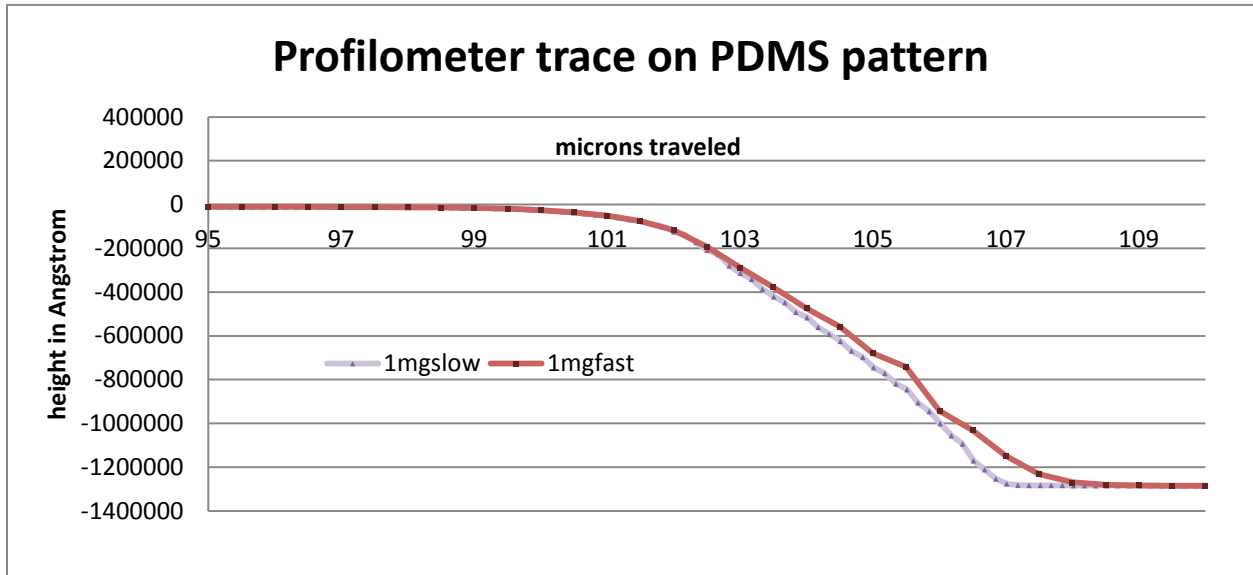


Some notes on measuring features on elastomers using profilometry:

Using the profilometer to measure soft, flexible materials like PDMS can be a challenge, because the material can be deformed as the stylus moves across the surface. Below are some examples using Sylgard 184, using several scan rates and stylus forces. Hopefully this information will help you to find the appropriate conditions for your samples.

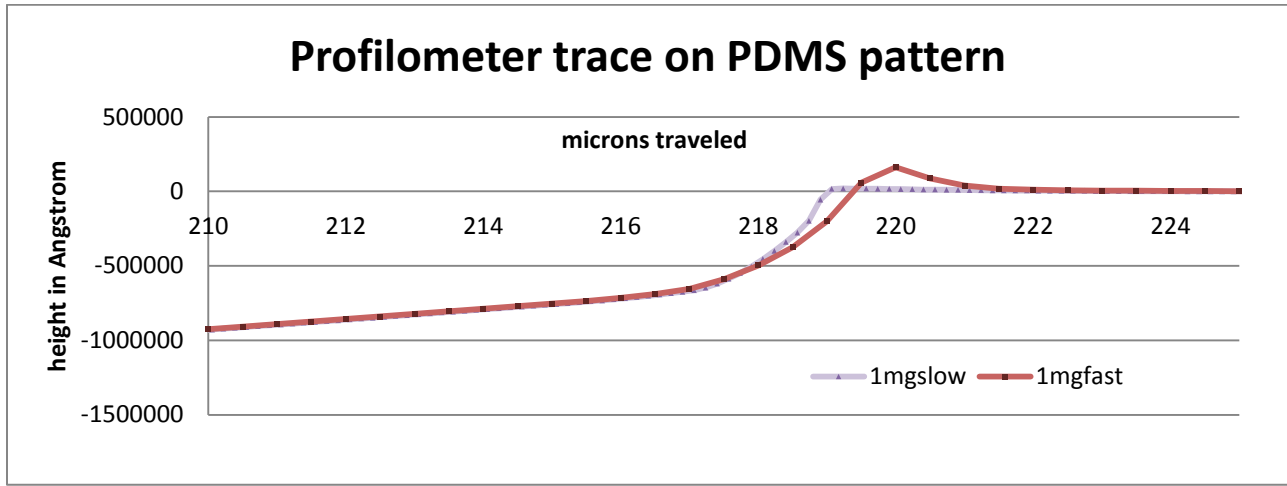
Effect of scan speed:

The “fast” speed shown below is about 0.8 microns/point, the “slow” speed was about 0.17 microns/point. When the stylus is traveling down into a valley, the slow speed decreases the noise and gives the stylus more of an opportunity to come to equilibrium with every measurement. During the fast scan, the stylus appears to “bounce” a bit. However, the overall change in height lines up very closely.



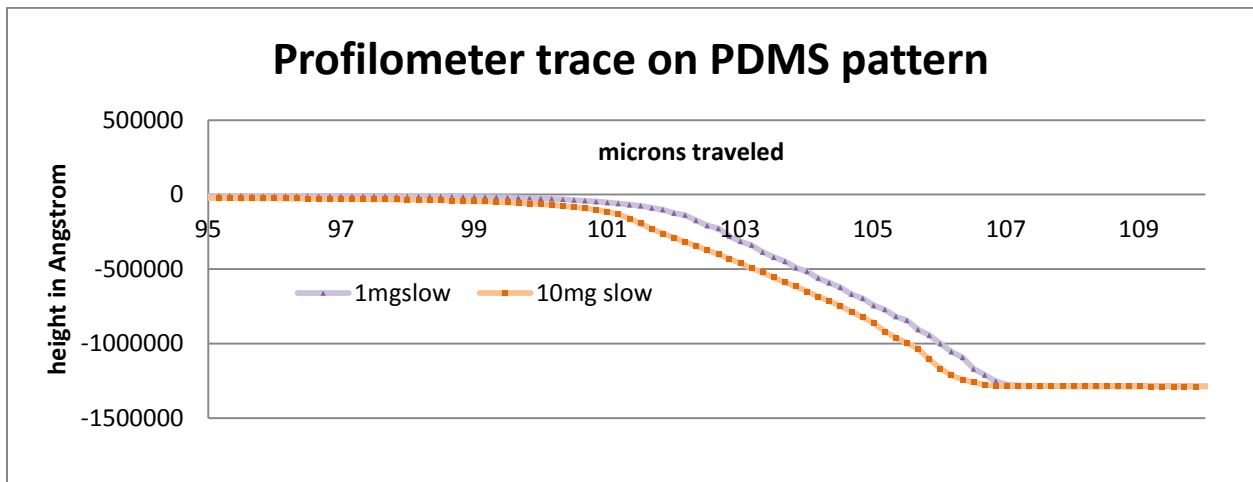
However, when travelling up a feature, the faster scan speed shows considerably more error. The lateral force of the stylus pushes the features to one side until the stylus slips all at once, traveling over the temporary bump of PDMS created by the lateral force. This bump is much less prominent with a slower scan speed. Therefore, if an accurate rendering of the edges is required, a slow scan speed is recommended.

(Note: this material is an elastomer—the bump that appears in the fast scan speed is in no way permanent. If a quick measurement is desired and the points around the edges can be ignored, the faster speed does a fine job of giving an accurate measurement.)



Effect of Stylus Force:

As the stylus force increases, the deformation of the soft features also increases. As the trace below demonstrates, a higher stylus force will show the edges of a trough as being wider than they actually are. Note, however, that the thickness measurement would still be very close to the lower-force measurement and that there is slightly less noise in the measurement.



As the stylus comes up out of the trough, the same trend is evident—a shallower slope from the stylus when it is exerting a higher force on the sample.

