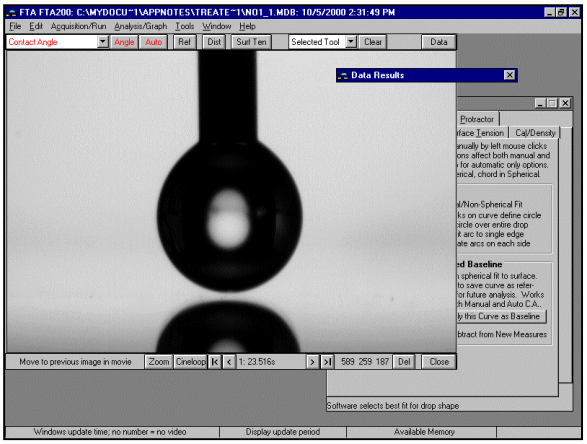
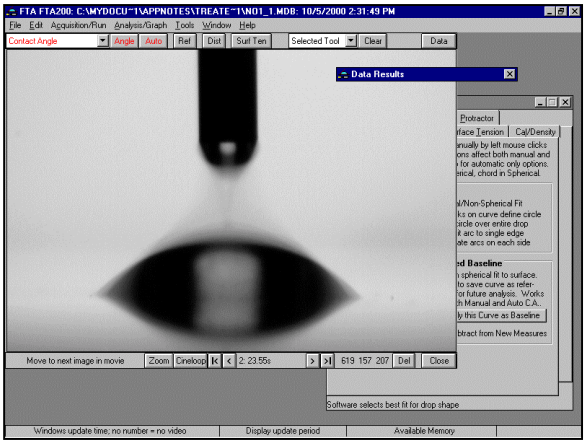
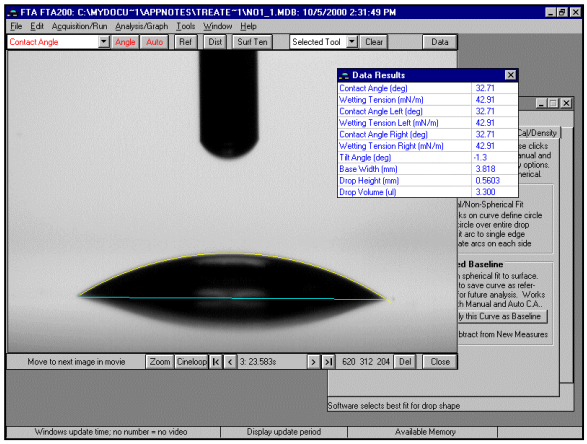
Treated Mylar Contact Angle Measurements

November 2, 2000

Three treated mylar samples were evaluated using water contact angles. The surfaces hydrated, meaning the surface energy increased upon exposure to water and the drop spread after being deposited on the surface. A pendant drop was slowly formed just above the surface. Eventually the bottom of the growing drop touched the surface and the drop then detached from the needle as the adhesion of the liquid to the surface pulled the drop from the needle. The process is illustrated in the following images, which show the drop touching off and the first static image analyzed for contact angle. The images are 33ms apart.

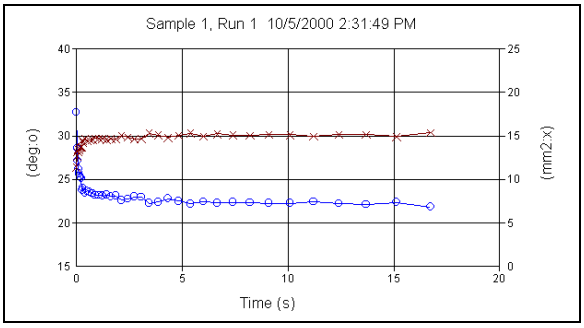






Pendant Drop Detachment Sequence

Contact angle and drop spreading data from a typical run for Sample 1 are graphed below. The graph shows the drop spreading and reaching an equilibrium angle after 15 seconds. All analysis was performed completely automatically.



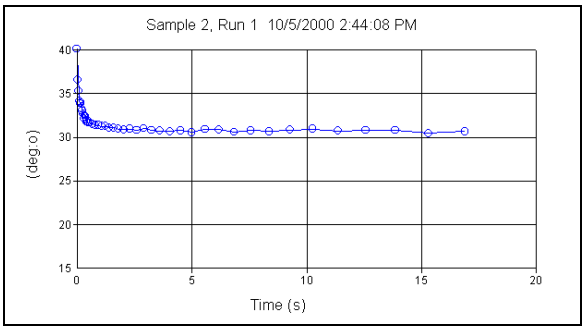
The initial contact angle is above 30°, but the equilibrium angle is 22.2°. Each sample was tested with four drops. For each drop, the six data points from 10 seconds on were averaged to form an equilibrium value. This equilibrium data is tabulated on the following page.

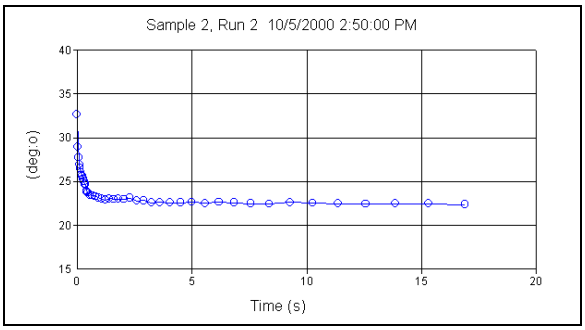
Drop #	Sample 1	Sample 2	Sample 3
1	22.2°	30.8°	20.1°
2	21.8°	22.5°	19.2°
3	21.7°	35.8°	19.6°
4	23.6°	26.4°	20.7°
Mean, μ	22.3°	28.9°	19.9°
STD, σ	0.88°	5.73°	0.65°

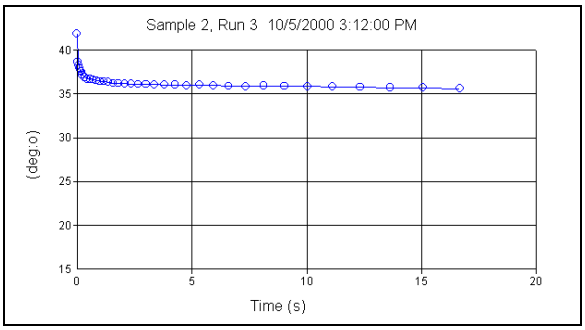
This table shows two things. First, Sample 2 is different from Samples 1 and 3. Sample 2 has a non-uniform surface compared to the other two, and it also has a distinctly higher mean contact angle (28.9° compared to 22.3° and 19.9°). The standard deviation for Sample 2 is 5.73°, which is much higher than the less than 1° σ for the other two.

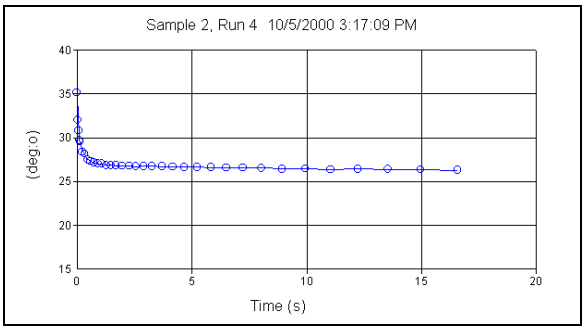
The other thing of note is that Samples 1 and 3 show it is *possible* to have very low contact angle variance. The measurements on Samples 1 and 3 are very repeatable.

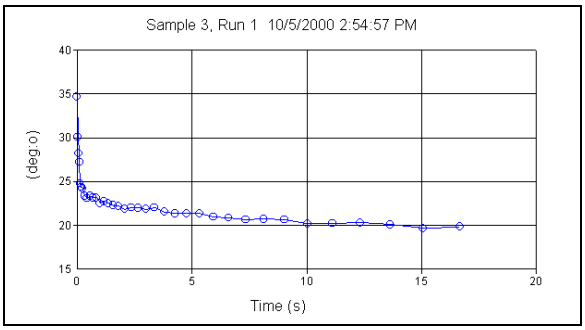
Representative contact angle graphs are shown below for Samples 2 and 3. Since Sample 2 is more "interesting," several graphs are presented for it.











Summary

Polymer surfaces which hydrate are best measured with a dynamic system where contact angles are measured over a sequence of images. Once the time response is known, an appropriate section of data can be averaged to obtain the equilibrium angle.