

Application Report

Wetting of single hair samples

Application report: AR101e
Industry section: Cosmetics
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Force Tensiometer – K14

Method: 

Keywords: Hair, wetting, silicone polymer, advancing/receding contact angle

Evaluating Silicone Hair Treatments

Samples

Liquids were silicone polymers with viscosity below 500 mPas. The solids were samples of dry, bleached hair.

Method

Measure two cycles of advancing and receding contact angle for each of the silicone polymers against dry, bleached hair using the Single Fiber Tensiometer K14 and the K121 Dynamic Contact Angle Software. Wetted length of the hair samples was also measured using hexane as the wetting liquid.

Results and discussion

The two silicone polymers have significantly different surface tension. One is 20.7 mN/m and the other is 25.5 mN/m. The higher surface tension silicone contained more polar groups on the side chains. On the basis of surface tension only, we would expect to get poorer wetting from the higher surface tension silicone.

Examining the plots of force versus position for the two, we see in Figure 1 that the higher surface tension silicone must have adsorbed more strongly onto the hair fiber. Advancing contact angle for this sample shows a substantial reduction between the first and the second dipping. The lower surface tension silicone (Figure 2) shows nearly the same advancing contact angle on the first and second dip. Data for this latter sample is not so easy to decipher. However, it shows that the hysteresis (distance between the advancing and receding contact angle) remains fairly constant during the first and second dipping cycle.

Wetted length must be measured on hair using a wetting liquid rather than calipers. Hair is often elliptical and has some surface structure. This is evident in Figure 3 which was used to determine wetted length. This change in fiber diameter along the length of the fiber shaft contributes to the apparent variation in contact angle observed for these samples.

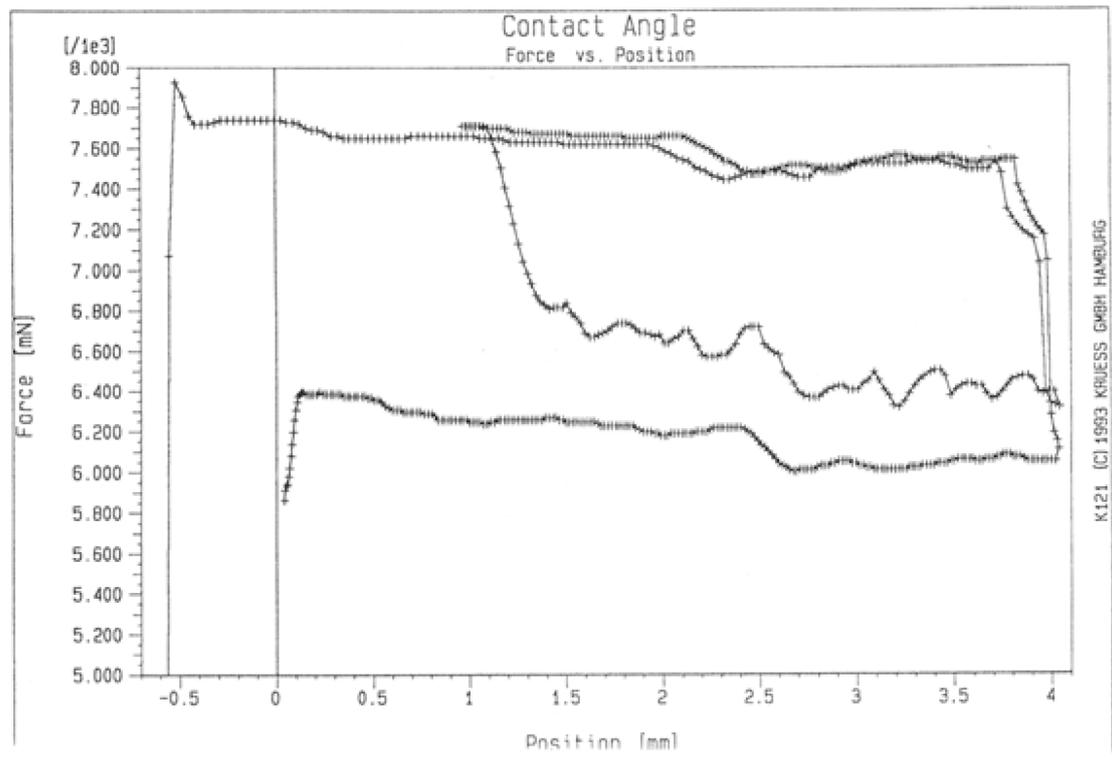


Figure 1

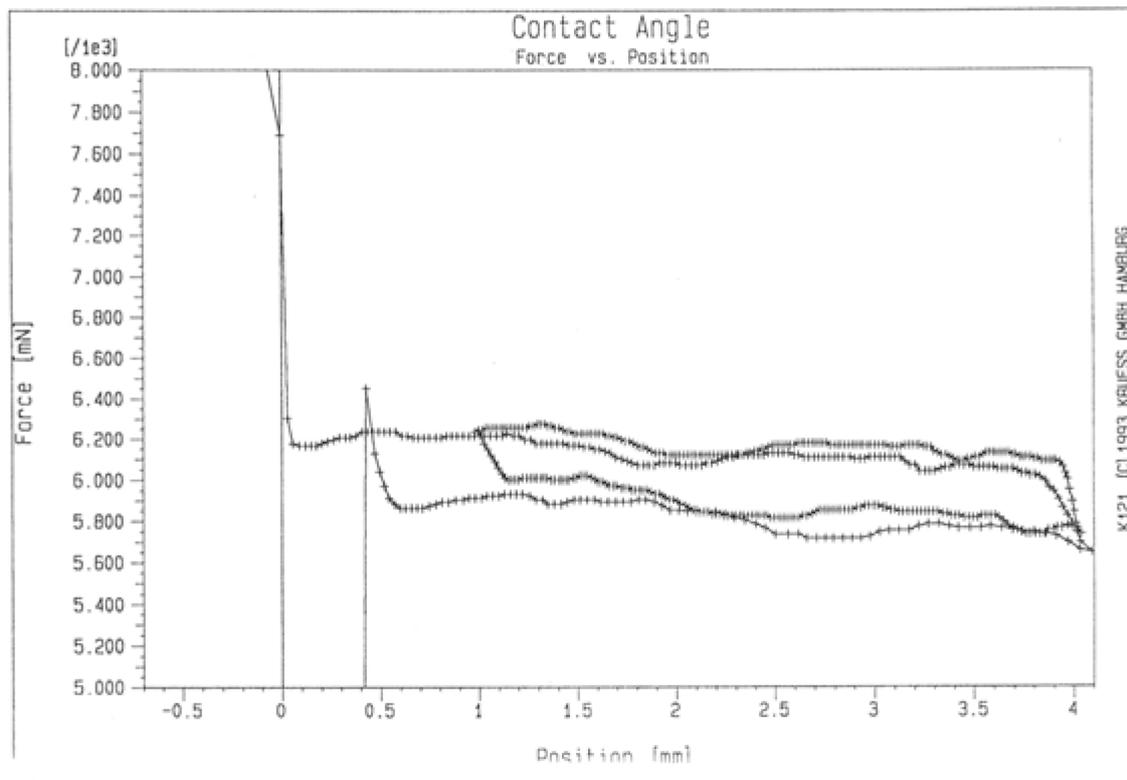


Figure 2

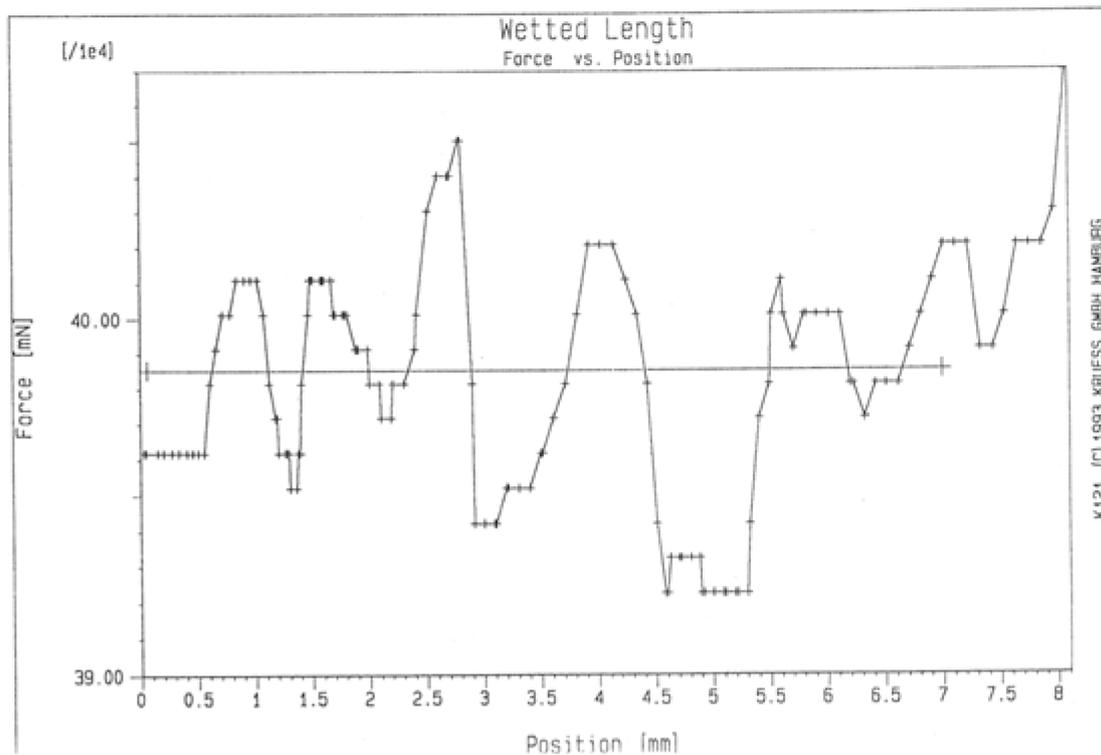


Figure 3

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