

Delta-8 multichannel microtensiometer: day-to-day operation

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Overview

The purpose of this technical note is to assess the day-to-day reproducibility of the surface tension data generated with Kibron's Delta-8 multichannel microtensiometer. For this purpose 200 000 surface tension readings were recorded and analyzed by common statistical means.

Experimental

Surface tension measurements were carried out on a Delta-8 multichannel microtensiometer in standard configuration. The instrument utilizes eight parallel microbalances fixed to meet the positions of the wells in a 96 format. The surface tension measurement is based on the Du Nouy method, i.e the maximum force exerted by the surface tension is recorded as the probes are withdrawn from the solutions. The resolution of the balances is 0.05 mN/m. The probes have a diameter of 0.5 mm and the measurement solution is completely wetting their surface. The instrument features automatic cleaning of the probes by heating prior to the measurement of the 96-well plate. One measurement loop, i.e. the cleaning of the probes and the measurement of the 96-wellplate, takes less than 2 minutes. For this particular loop test the heating was omitted, however. The surface tension of a 1:3 water:DMSO solution was measured by applying 50 μ l of the above solution in the wells of a 96-wellplate (Kibron Inc.). The plate was measured continuously for 77 hours resulting in 2100 loops (201600 surface tension readings).

Results and discussion

The mean value of the surface tension readings of the water/DMSO solution and the standard deviation are compiled in Table 1. Also given in this table are the minimum and the maximum values of the measured surface tension. The standard deviations for the eight individual channels varied between 0.2 and 0.4 mN/m.

Table 1: Statistics of surface tension measurement of water/DMSO solution with Delta-8.

Mean	53.6 mN/m
SD	0.4 mN/m
Max	54.5 mN/m
Min	52.3 mN/m

The change in the solution properties and temperature in the course of the loop test is shown in Figure 1. The figure shows the data measured with channel 1 having the highest standard deviation, 0.4 mN/m. The DMSO-water mixture was used since it reaches an equilibrium with the surrounding atmosphere, and can therefore be used to avoid evaporation in long experiments. There are, however, some fluctuations in the measured surface tension values. These are likely to be due to changes in the composition and properties of the DMSO-water mixture, which vary with changes in humidity and temperature. All channels follow the same pattern which supports this conclusion.

Concluding remarks

The instrument maintained high precision during three days of continuous operation. The Delta-8 is an ideal solution for high-throughput surface chemistry applications; it consumes only tens of micrograms of material, while not compromising high precision, thus addressing the problems of conventional surface tension measurements.

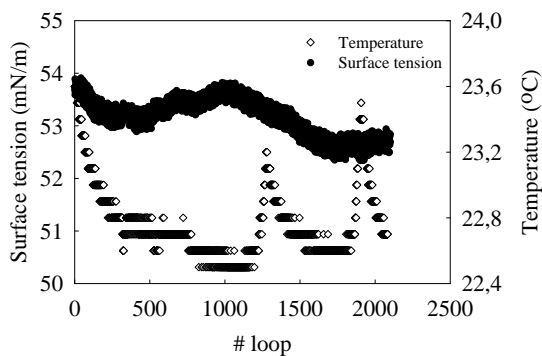


Figure 1: Surface tension and temperature as a function of datapoint.