dataphysics
Understanding Interfaces

Fast and easy to use determination of surface energy of solids with the new pressure-based double dosing system DDS-P for the OCA series from DataPhysics Instruments.

Background

The surface energy of solids is the significant property that is used to verify a successful pretreatment or cleaning process of a solids surface. Furthermore the knowledge of the surface energy facilitates an estimation of the wetting behaviour and adhesive properties of the solid for further processing.

In order to analyse large quantities of samples, often the case in quality control, an easy to use and fast determination of the surface energy is a fundamental requirement.

With the pressure-based double dosing system DDS-P, DataPhysics Instruments offers the possibility to determine the surface energy with one-click using the optical contact angle measuring and contour analysis systems of the OCA series by simultaneously dosing two liquids and measuring their contact angles.

Fig. 1: The pressure-based double dosing system DDS-P from DataPhysics Instruments

Measuring method

For the surface energy determination of a polyamide sample, water and diiodomethane were used as test liquids. The purity of the test liquids was tested beforehand according to the pendant drop method using an electronic syringe module ESr-N.

The pressure-based double dosing system DDS-P was filled with the test liquids and was used with an optical contact angle measuring and contour analysis system OCA 25 (see Fig. 1) and controlled by the corresponding software.

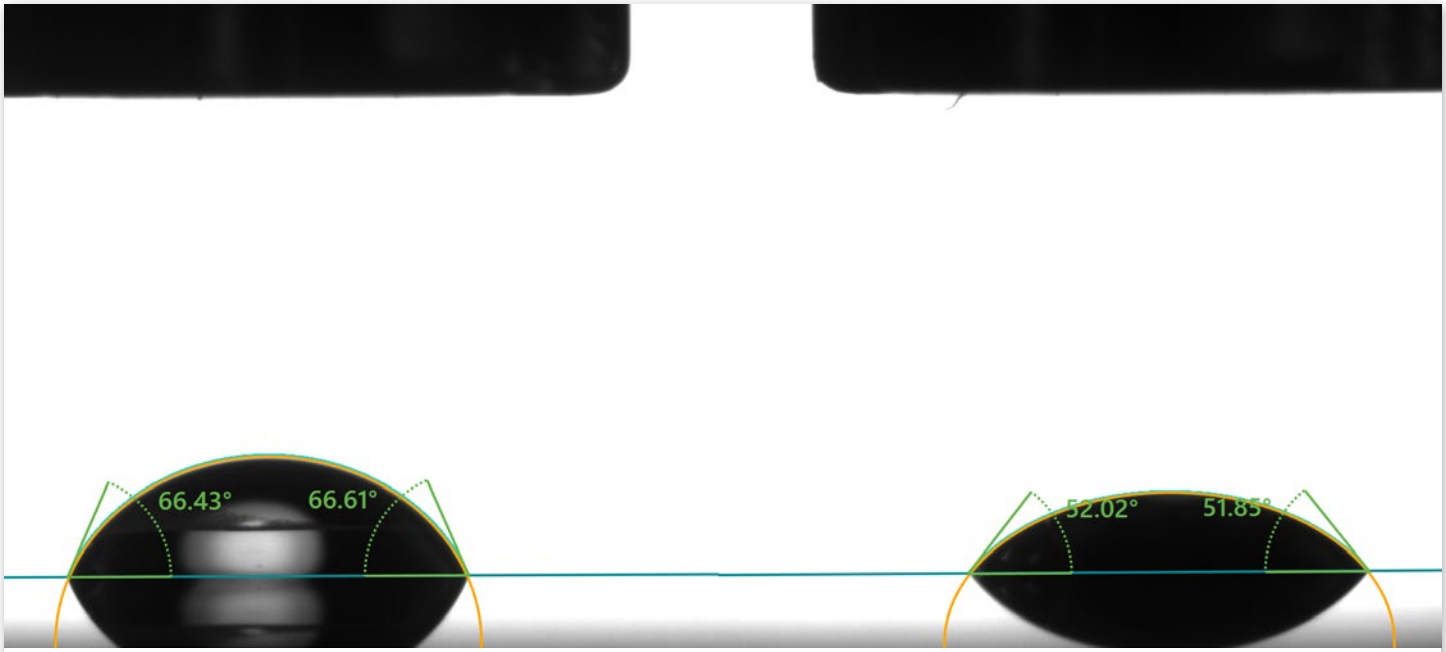

Fig. 2: camera image of the water drop (left) and the diiodomethane drop (right) with evaluated contact angles

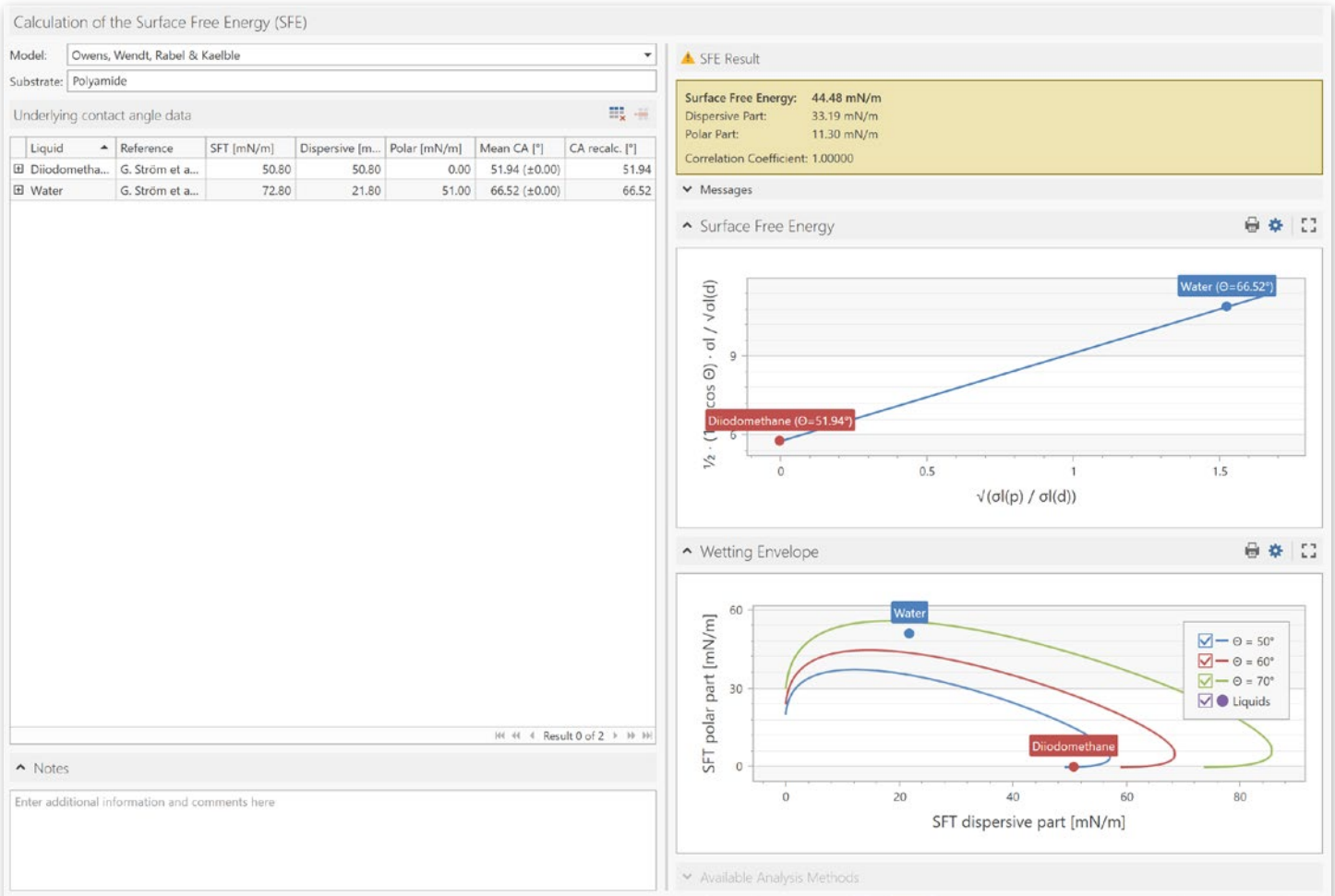

Fig. 3: evaluation of the surface energy

With the "One-Click-SE" method of the software, at the push of a single button both test liquids are simultaneously dosed on the investigated surface, the contact angles of both liquids are evaluated (see Fig. 2) and the surface energy is determined according to the OWRK method [1-3]. Finally the surface energy including its polar and dispersive components is presented in a result window (see Fig. 3).

Results

The polyamide sample has a surface energy of σ = 44.48 mN/m (polar component: σ^p = 11.30 mN/m; dispersive component: σ^d = 33.19 mN/m).

The overview diagram of the software is shown in figure 3. The optical measurements of the contact angles of diiodomethane (θ = 51.94°) and water (θ = 66.52°) are shown in figure 2.

Summary

The pressure-based double dosing system DDS-P in combination with the optical contact angle measuring and contour analysis system OCA and its corresponding software from DataPhysics Instruments, enables the determination of the surface energy of a solid with one click. Two test liquids are simultaneously dosed onto the solid surface, the contact angles evaluated and the surface energy including its polar and dispersive parts is determined.

In summary the DDS-P enables a time saving, easy to use and reliable analysis of the surface energy.

Literature

[1] Owens, D. K. and Wendt, R. C. (1969), Estimation of the surface free energy of polymers. J. Appl. Polym. Sci., 13: 1741-1747.
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[3] W. Rabel, Einige Aspekte der Benetzungstheorie und ihre Anwendung auf die Untersuchung und Veränderung der Oberflächeneigenschaften von Polymeren. In: Farbe und Lack 77,10 (1971), S. 997-1005.

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