

TECHNOLOGY OFFER

QUANTIFICATION OF SOLID-LIQUID ADHESION WORK

The presented method establish the opportunity to measure solid-liquid work of adhesion in a direct and absolute manner – without the need of measuring the contact angle. The determined value of adhesion work is an absolute one, in contrary to all other adhesion force measurements, which methods allow only relative (comparative) investigations. A uniqueness of our method is that it can be used in the whole contact angle range – from perfect wetting to complete repellency – without pre-wetting of the investigated surface.

BACKGROUND

The quantity of solid-liquid work adhesion has a central role in several fields of industrial and academic R&D. Its value is calculated from measured contact angle, but contact angle measurements suffer from different uncertainties. Especially, the receding contact angle is often not well-defined. As a result, only the advancing contact angle is used, which provides only a partial characterization.

METHOD

Our method is based on a capillary bridge of the test liquid, which is stretched between the investigated solid surface and the base plate of a cylinder. Changing the length (or volume) of the liquid bridge causes advancing or receding contact line on the solid surface. A force balance measures the capillary force during the decrease and increase of the bridge length, therefore the mechanical work can be calculated. This work is spent for changing the interfacial areas of the liquid bridge and these values can be determined by image analysis. Knowing the surface tension of test liquid, the solid-liquid adhesion work can be calculated for advancing and receding situation. In the advancing situation, the adhesion work quantifies the spreading of the liquid on the solid surface, while in the receding situation, it represents the work required to remove the liquid from a unit of solid surface.

The force balance can be placed in two configurations: the existing tensiometers already have an upper force balance, while lower force balance can be an upgrade for contact angle goniometers. In the arrangement with lower force balance, the upper cylinder can be a capillary tube, thereby simplifying liquid handling and automation. Furthermore, it also facilitates measurements in liquid medium that enable e.g. quantification and optimization of cleaning processes.

ADVANTAGES

Adhesion work is determined

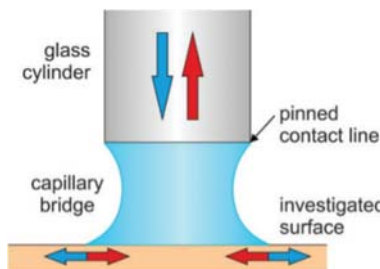
- independently from contact angles
- in an absolute manner [mJ/m^2]
- separately for wetting and dewetting situations
- with high accuracy and sensitivity
- in the whole contact angle range
- without prewetting the investigated surface

Arrangement with

- upper force balance is ideal for existing tensiometers
- lower force balance is suitable for existing goniometers

Lower force balance facilitates

- simple automation
- easy measurements in liquid media



DEVELOPMENT STATUS

Working prototype

APPLICATIONS

Suitable either as upgrade for existing tensiometers and contact angle goniometers or as an all-in-one standalone apparatus. Unique solution for R&D of e.g. paints, lubricants, adhesives, pesticides, coating materials, etc.

KEYWORDS

Wetting
Contact angle
Adhesion work

IPR

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HU P2100405
PCT Application:
PCT/HU2022/050083

OPTIONS

License agreement
Patent sale

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