

Contact Angle Measurements in the RMS Foundation

A surface can be quickly characterised by measuring the contact angle: is it hydrophilic or hydrophobic? Is a sample contaminated? Did a coating process work?

The contact angle of a drop on a surface strongly depends on the chemistry of the surface and on the test liquid: If both are polar (e.g. a water

face properties. For example a more hydrophilic dental implant leads to a faster osseointegration [1]. This property can be controlled by measuring the contact angle: a smaller contact angle was found on a clean implant compared to an implant which was stored for several weeks on a bench (figure 2).

Contact angle measurements can be used for the characterisations of materials too, as shown in a research project on poly(HEMA-co-MMA) mixed polymers (figure 3). With increasing MMA-fraction of the co-polymer, the surface changes from hydrophilic to hydrophobic.

In general, a surface can be characterised quickly by measuring the contact angle. But this is only one aspect of the surface analysis and it is ideally accompanied by XPS (X-ray photoelectron spectroscopy for the surface chemistry) and/or

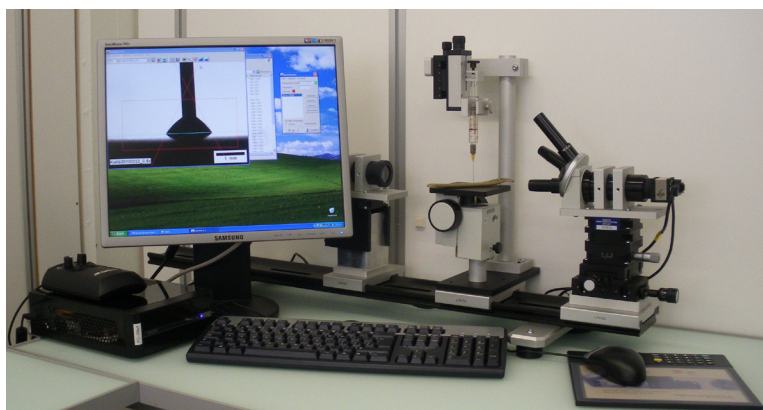


Figure 1: Equipment in the RMS Foundation for measuring the contact angle.

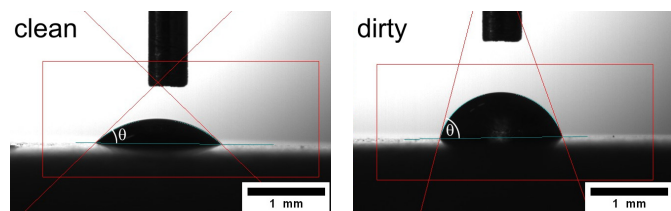


Figure 2: Contact angle of a clean ($\theta=44^\circ$) and of a «dirty» implant ($\theta=73^\circ$, after several weeks on a bench).

droplet on a surface with many OH-groups), there is a good wetting and the drop spreads out on the surface. This is then a hydrophilic surface with a contact angle θ typically smaller than 45° . If there are only few polar groups, the contact angle of water will be higher. Above a contact angle of 90° a surface is called hydrophobic. On superhydrophobic surfaces ($\theta >160^\circ$), the water drop balls up to a spherical shape enclosing air underneath. This effect is also called lotus effect and is due to a combination of a hydrophobic surface and a rough topography.

The biological performance of an implant is generally controlled by sur-

SEM (scanning electron microscopy → topography).

1. F. Schwarz et al. Journal of biomedical materials research – Part B Applied biomaterials 88, 544-557 (2009).

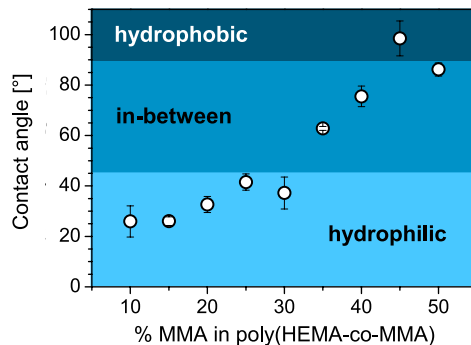


Figure 3: Contact angle of poly(HEMA-co-MMA) (poly(2-hydroxyethylmethacrylate-co-methylmethacrylate)) co-polymers.

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Our equipment for measuring the contact angle:

Surftens universal from OEG GmbH (Frankfurt, Germany)

Options:

- *Static measurement of the contact angle:*

Measurement of the left and right contact angle of a static drop on a surface in its equilibrium.

- *Dynamic measurement of the contact angle:*

The volume of the drop is continually increased and later decreased and the advancing and receding contact angles are measured on this drop (average of several angles/drop).

Higher reliability for rough or inhomogeneous surfaces.

- Acquisition of movies with the possibility to analyze each image separately.

Preset values:

- Flat and homogeneous surfaces particularly for static measurements.
- Dimension: up to 20x20x6 cm, in certain circumstances even larger.

Normative references:

ASTM D7334 and DIN 55660-2

Please discuss your questions with us! We will be happy to advise you.

Or ask for our service catalogue. You will find this and other information on our website as well.

The RMS has been certified according to ISO 9001:2008. Selected services have been accredited according to ISO/IEC 17025.