Du Noüy ring for interfacial rheology

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The Du Noüy ring, commonly used for interfacial tension measurements, has been successfully applied to interfacial testing using a Thermo Scientific™ HAAKE™ MARS™ Rheometer. The relevant interfacial rheological properties, such as the interfacial shear viscosity or the interfacial storage and loss modulus can be determined quantitatively.

A commercial available Du Noüy ring made out of a Pt-Ir wire is clamped in an adapter (Figure 1) for use with a HAAKE MARS Rheometer. The lower part of the measurement cell consists of a glass cup which contains the sample. A container holder can be used to hold the cup.

Since interfacial measurements are very sensitive regarding to contaminations the Du Noüy ring has to be flamed before each measurement.

When working with the Du Noüy ring (1) the diameter values in the property section in the Thermo Scientific™ HAAKE™ Rheowin™ Software have to be edited:
inner diameter = diameter of the Du Noüy ring
outer diameter = diameter of the measuring cup.

According to the chosen diameters the A- and M-factors will by calculated automatically. After this setup, it is mandatory to conduct a high quality MSC as well as an inertia determination.

For the measurement the ring is positioned at the interface of two liquids or, in the case of a foam sample, at the interface of a liquid and a gas.

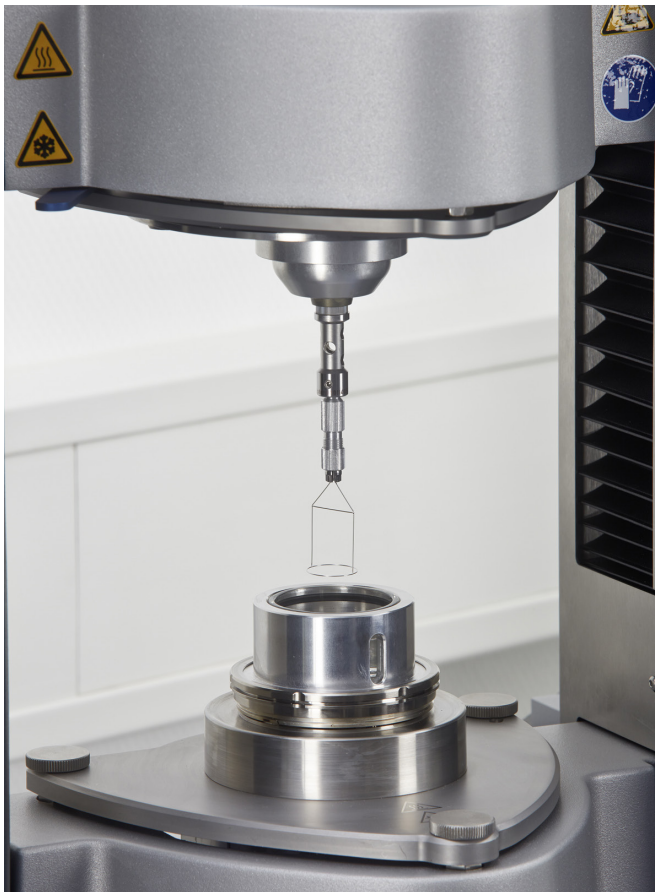

Figure 1: Setup for interfaciel rheometry.

Under gap settings in the HAAKE RheoWin job “Use current gap” has to be chosen and the respective measuring routine can be started. During the measurement the dynamic interfacial shear moduli G_i' and G_i'' (mN/m) were recorded.

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Different measurements using the Du Noüy ring have been performed, such as measurements on (protein stabilized) emulsions and foams of food products as well as measurements on cosmetic products. Another example is interfacial measurements on the interfaces between different layers for curtain coating.

Figure 2 shows the results for the stability of two different shaving foams. Significant differences could be measured. Both foams are stable over the measuring period of half an hour. The values of G_i' and G_i" of sample A are much higher than those of sample B, which means that sample A has a (much) stiffer structure. In addition sample A is more elastic than viscous (G_i' > G_i") which results in a more comfortable application of the foam on the skin.

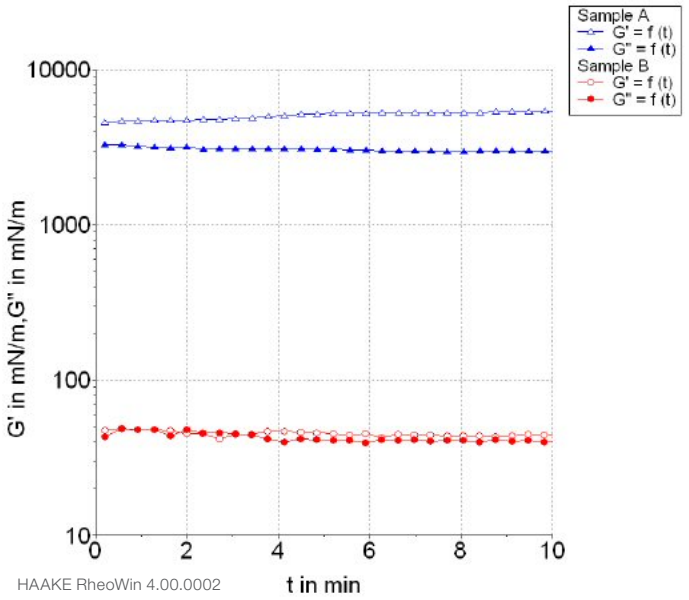

Figure 2: Measurements on different shaving foams using a Du Noüy ring.

Ordering information

Product	Order no.
Du Noüy ring consisting of a Pt-Ir wire (Ø 0.370 mm and outside diameter of the Ring is 19.450 mm)	
For rheometer models HAAKE MARS I/II/III with adapter (222-1276)	222-2412
For rheometer models HAAKE MARS 40/60 with adapter with "Connect Assist" (222-2130)	222-2413
Necessary accessories	
Interfacial rheometry, Module for HAAKE RheoWin 4 Software	098-5057
Universal container holder incl. height adjustement (2)	222-2049
Temperature control adapter Du Noüy cup incl. Teflon cup (222-2460) and glass cup (222-2461)	222-2459
Du Noüy ring (spare part)	006-4161

References

1. User Guide "Du Noüy ring measuring geometry" 006-2335
2. C. Küchenmeister-Lehrheuer, J. Nijman, F. Meyer, "Universal holder for measurements in original containers" Thermo Fisher Scientific Product information P048

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