



Rheometer accessories

Special measuring geometry for a simple and reliable determination of the open time of coatings

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The drying behaviour of paints and coatings has always been a topic for investigations. Due to the regulatory pressure towards a more sustainable coatings industry, the transition from solvent based to water based products puts the drying behaviour into the focus even more.

Rheological measurements on drying or curing samples are amongst the classic repertoire of analytical methods. For drying samples the rheological test condition usually give a distorted picture because the sample in the measuring geometry of a rheometer has a different volume-to-surface-ratio compared to a paint after application.

To bring the measurement conditions closer to reality, an open measuring geometry has been developed, which allows the evaporation of the solvent during the rheological test.

This type of geometry consist of 2 parts, a holder for the coated substrate and a rotor with a special design to monitor the drying process without affecting it. The holder is designed to fix plates of rigid materials into place, like e.g. glass, ceramic or wood based panels. The rotor consists of 12 metal pins evenly distributed around a ring in such a way that the pins can “grip” into the coating’s surface without sealing it off from the environment (Figure 1).

For a measurement it is recommended to determine the contact position between the rotor and the uncoated substrate first, then coat the substrate outside the rheometer, fix the now coated substrate onto the lower stage again with the holder and lower the rotor until the tips of the pins penetrate the coating but do not touch the substrate (Figure 2).

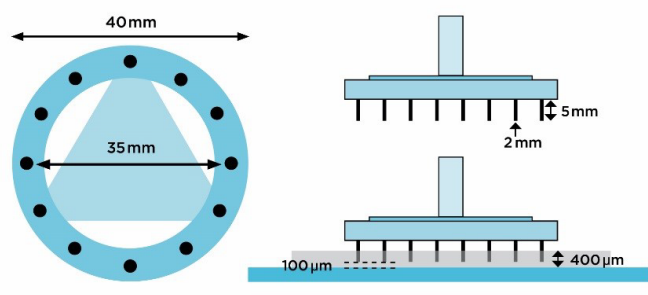


Figure 1. This rotor consist of 12 pins evenly arranged around a metal ring. During the measurements, the pins will penetrate the surface of the coating without touching the substrate surface underneath.



Figure 2. A glass plate with coating fixed into a Thermo Scientific™ HAAKE™ MARS™ Rheometer with the special holder. The rotor is in measuring position with the tips of the pins in the coating.

The drying of the coating is monitored via the torque necessary to move the pins through the coating at a constant low speed. A sharp change of slope of the increase of rheometer's torque (M) over time indicates the open time of the coating (Figure 3).

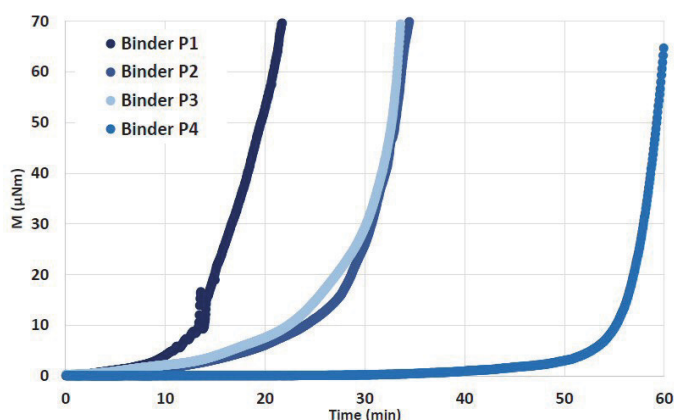


Figure 3. The influence of different types of binders on the same coating formulation. The open time varies between approx. 10 min and 55 min.

Ordering information

Product	Order number
Ring rotor P40-35 12P/SS with "Connect Assist", quick coupling with automatic recognition for HAAKE MARS 40 and 60	222-2356
Support fixture for the analysis of the open time of paints and inks coated on a substrate, for use with a Thermo Scientific HAAKE MARS Rheometer, consisting of a lower adapter plate clamp ring to fix the substrate with 3 screws.	603-2302

Reference

1. Rheological Investigations on the Drying of Polymer Dispersions and Paint Films, Jesus Pitarch et al., www.PCIMAG.com, April 2018, P60-64

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