

Assure, solve and discover.

Introduction

As a leading manufacturer of rotational rheometers, Thermo Fisher Scientific supports the inks, paints and coating industry in developing modern, sustainable products across diverse fields, including architecture, construction, automotive industry, printing, and cosmetics. Paints and coatings are complex mixtures composed of pigments, binders, solvents, and various additives like anti-foaming, curing, and dispersing agents. Each ingredient plays a crucial role in determining the paint's quality and performance, including factors such as adhesion, leveling, strength, gloss, stability, durability, and impact resistance.

The high flexibility of the Thermo Scientific™ HAAKE™ Rheometers, with their broad range of measuring geometries and accessories including application-specific measuring cells for ultra-high-shear testing, UV curing or powder rheology allow for a comprehensive sample characterization to meet the industry demands.

With decades of application know-how, our worldwide demonstration labs, and scientists from different disciplines including rheology, extrusion, or spectroscopy, we can assist you in the realization of your specific application goals. Talk to our experts today and learn what options are available to further your advancement in this innovative arena (contact us).

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Paints, inks, and coatings rheology requirements A selection guide for rheometer and software features

Overview

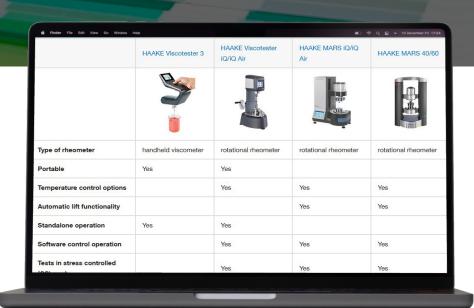
Paints, inks, and coatings are used in various fields ranging from architecture and construction to the automotive industry, printing, and cosmetics. Typical challenges in product development and manufacturing include ensuring consistency and stability, optimizing application properties, controlling drying and curing times, and assuring resistance to environmental influences and compliance with environmental regulations. Advanced rheometer capabilities play a crucial role in meeting these demands.

Discover the perfect rheometer for QC and R&D needs

Full selection guide

Ensure precise results with the Thermo Scientific™ HAAKE™ RheoWin™ Rheometer Software, which enables the creation of automated SOPs.

View mini tutorials





A walk-through of how to set up and adjust HAAKE RheoWin software



Procedure Library

Walk-through of the test procedure library including how to access the library, job types, job descriptions, and how to change settings



HAAKE RheoWin Software.

A walk through how to create a rheological test procedure from sample loading step, to rheological job creation and data evaluation.



FAQs: Expanding rheometer capabilities with the right accessories

Question	Documents
Which measuring geometry - plate, cone or cylinder - is most suitable for a sample or application?	The choice of measuring geometry—plate/plate, plate/cone, or cylinder measuring—depends on sample volume, particle size, and measurement requirements. Different sizes and finishes are available.
How can sample slippage be prevented during the rheological measurement?	Use matching diameter upper rotors and lower plates for easier loading and trimming, and choose sandblasted or serrated finishes on parallel plates to reduce slippage, more information.
Are there geometries available that are particularly easy to clean?	Yes, discover the "Easy Clean" version and see how simple cleaning can be, more information.
What is the best method to prevent sample evaporation and drying out?	Use one of the available sample covers, with solvent trap or inert gas connection if needed, more information.
Immobilization test – how long does it take for a sample to dry?	An immobilization cell can be used to simulate reliable drying conditions, more information.
Open time - How long can a product be processed?	Use special measuring geometry to easily and reliably determine the open time of coatings, more information.
High shear testing - How can very fast coating processes be simulated in a measurement?	Use a temperature module with high shear measuring geometry for viscosity measurements at high shear rates to simulate very fast coating processes, more information .
How can UV curing be measured rheologically and how can changes at the molecular level be better understood?	UV curing can be measured rheologically using a measuring cell for UV-assisted thermal curing, combined with simultaneous FTIR spectroscopy to better understand molecular-level changes, more information.
Which DIN / ISO standards can be fulfilled with Thermo Scientific HAAKE Rheometers?	Thermo Scientific HAAKE Rheometers fulfill a variety of established ASTM/DIN/ISO standards. Discover which ones! • ASTM, DIN and ISO standards
	Relative measurements according to ISO 2884-2

The influence of curing kinetics and viscoelasticity on surface texture

Rheological tests in oscillation for comprehensive characterization of powder coatings

Overview

Powder coatings offer many advantages such as zero VOC emissions, thicker coating layers without sagging, recyclability, and cost efficiency. However, differences in curing kinetics and viscoelastic properties can influence the surface quality of the final product. Therefore, rheological properties are determined before, during, and after the temperature-induced curing step in order to understand how a certain formulation will work during processing and the actual coating application. The method of choice for monitoring curing processes rheologically are tests in oscillation mode.

View the application note



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Investigating the shear flow and thixotropic behavior of paints and coatings

Overview

Paints and coatings are complex mixtures composed of pigments, binders, solvents, and various additives like anti-foaming, curing, and dispersing agents. Each ingredient plays a crucial role in the quality and application behavior of a paint; this includes factors such as adhesion, leveling, strength, gloss, stability, durability, and impact resistance. As highly structured particle dispersions, paints exhibit intricate flow behaviors, and they are often subjected to diverse shear rates and environments throughout their lifespan. Therefore, comprehensive rheological testing is essential to thoroughly evaluate the overall performance of paint.

View the application note



Investigating the shear flow and thixotropic behavior of paints and coatings

Rheology, paints, coatings, thixotropy shear recovery, shear trinning



Figure 1: HAAKE NARS (Q Rheo

Paints and coatings are intricate blends of various components such as pigme binders, solvents, and other additives like anti-foaming, curing, and dispersing agents (to name a few). Each component or additive has a specific role in determining the overall quality of the paint as well as is performance both during and after application such as adhesion, leveling, strength, gloss, stability, durability, impact resistance, educing a surround, severing, servings, surround, surround, unroundy, inspect redesigner, etc. Paints are considered highly-structured particle dispersions and as a result, they commonly display complex flow behavior.

Over its lifetime, paint will be exposed to a wide range of shear rates and shear with mention, purify an are improved as a more range or alread range and are supplemented as a more review of shear reviews. During storage and transport, paint will experience low levels of shear (<1 s*) and in order to prevent phase separation, the paint is expected to have a high. (C13) artu in unusi su pravan prisand apparation, and pair in a dependence or remaining solid-like viscosity and even display a yield stress. During processing, the pumpebility and energy required for mixing and transport directly correlates with its viscosity and energy resumed for mixing and warmpoon underly continues and its assumption at medium-to-high shear rates (10 to 1000 s.*). Finally, during application (brushing, as transmirror may a size α rate of α and α by a subjected to high shear rates (-100 c.) where it rolling, spraying, stc.), the paint will be subjected to high shear rates (-100 c.) where it runing, spraying, stdy, a te pant, will be adupted a ringle a war to supported to behave as a relatively low viscosity, free-flowing Equid.

As a result, a simple single-point viscosity measurement cannot fully capture the As a result, a suruse anagor-point visionally research results as not vary suggested to complex flow behavior of paint Thus, paint seeds to be evaluated using a full suite of theological tests in order to truly examine its overall performance. Here, we assessed the rheological behavior of a commercial paint product with the Thermo Scientics. HAKE" NARS" (Q Rhometer using three fundamental tests: stapped shear rile MAINLE. MAYOR IN PRESUMENT USING METER ANALYSIS FOR THE MAIN STATE OF THE MAIN STATE visuosity primate, a mountary work, with armore traversely below experience commented can help simulate how the pairt is processed and applied but one also help further optimize and evaluate final product formulations.

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Performance evaluation of paints and coatings

Investigation of UV-curing behavior of adhesives

Investigation of UV light-curing adhesives

Impact of the UV light intensity on the shrinkage and curing behavior of an ultraviolet light-sensitive adhesive

Overview

UV light-sensitive adhesives are single-component materials that cure within seconds upon exposure to UV radiation. The curing mechanism typically involves the generation of free radicals from a photo initiator, which then interact with monomeric and oligomeric components to form a crosslinked polymer network. The curing speed is highly dependent on the intensity of the UV light, which spurs adhesive joints to form rapidly, often within seconds, through free radical polymerization. Combined with a suitable UV light source, a rheometer can assess the reaction kinetics and shrinkage during the curing process.

View the application note



Impact of irradiation time on reaction kinetics and thermomechanical properties of an UV light sensitive adhesive

Philipp Beutler, Thermo Fisher Scientific, Karlsruhe, Germany

HAAKE MARS 40/60 Rheometer, UV light induced curing. UV rheology, achesives, free radical curing, DMTA, glass transition temperature, DELOLUX 505 UV LED light source

UV light sensitive adhesives cure into a chemically crosslinked polymer network when exposed to UV light. Depending on the resulting crosslinking density, some polymer chains may not be fully integrated in this network. Therefore, the degree of cure, and hence the share of crosslinked polymer chains of an adhesive, are reflected in its resulting mechanical properties (f).

Polymer chains become increasingly mobile as the free volume expands with increasing temperature. Beyond a certain temperature, polymeric materials show a phase transition from a rigid and inflexible glassy state into a softer and more fexible nubbery state. This so-claired glass immanum resume resource and the framework of the frame properties to change charmscusty, and the deficiency of the support of the subject of this restligation was a CELO® Bath Circulator. The subject of this restligation was a CELO®

When equipped with an UV light source and a temperature control device, a mearneter can be used to investigate both

properties of a UV light sensitive adhesive are presented and discussed. Details on the measurement procedure are also

For this study, a Thermo Scientific" HAAKE" MARS" 60 Rheometer was used, squipped with a Pasier temperature Mneometer was users, equipped who a renear temperature of module (TM-PE-O UV) and an electrical temperature-controlled



hood (TM-EL-H). Counter cooling of the temperature module

During curing, UV light sensitive adhesives undergo a strucchange from a low-viscosity to a solid-like material. The cured the maction kinetics during this curry process is view as well as the change from allow-discostry to a sord-like material in a sord-like material properties of the UV light sensitive also form a perminant port between the measuring distribution. paraties place with a diameter of 15 mm. The integrated optical three on the curring kinetics and resulting bermo-mechanical put of the TM-PEC CIV allows for horrogenous sample put of the TM-PEC CIV allows for horrogenous sample. illumination through a borositicate glass plate from the bottom. More information regarding the TM-PE-C UV can be found in (8).

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Paints, inks, and coatings rheology resources

Application laboratories

In our fully equipped application laboratories, we are ready to demonstrate the performance of our instruments through test measurements with customer samples. Additionally, we support our customers in the development of future-oriented applications or in establishing robust and reliable routine measurement protocols. We provide a broad range of product and application solutions, and our team of application scientists and interdisciplinary technology specialists is on hand to answer your questions (contact us).

Register for application and product information at **thermofisher.com/specoptin** to gain access to the latest resources to accelerate your research and improve laboratory productivity.

Seminars and trainings

Thermo Fisher Scientific offers comprehensive training programs, in-house seminars, and practical rheology and extrusion courses at various locations around the world. We support our customers through an array of on-demand webinars, videos, and application notes from our experts, sharing the benefits of our interdisciplinary knowledge in polymer science and technologies (thermofisher.com/LearnWithUs).

Learn more at thermofisher.com/rheometers

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