Anton Paar

Viscometry & Rheometry

Solutions for the pharmaceutical industry

MASTER THE FLOW

EVERYTHING FLOWS, ALSO IN THE PHARMACEUTICAL INDUSTRY. ANTON PAAR OFFERS A VARIETY OF SOLUTIONS TO DETERMINE THE FLOW AND DEFORMATION BEHAVIOR OF A VARIETY OF MATERIALS – FROM OILS USED AS RAW MATERIALS TO END PRODUCTS SUCH AS COUGH MEDICINE AND OINTMENTS, EVAPORATION FLUIDS, AND EVEN CATHETER POLYMERS.

WE KNOW YOUR DAILY CHALLENGES – LET US GIVE YOU THE RIGHT SOLUTIONS.

I have to measure a lot of samples per day. I need instruments that are error-proof and easy-to-handle. How can Anton Paar instruments support my daily work in the laboratory?

Anton Paar instruments are equipped with numerous features that make it easy to measure challenging samples of any type and help avoid human errors. Automatic spindle/measuring system recognition by Toolmaster™, for example, prevents manual selection errors and ensures full traceability of your results. The unique air-counter-cooled Peltier temperature devices for the most accurate sample temperature control not only help you save space in your laboratories but also reduce maintenance costs compared to established water bath solutions.

How can I be sure that the instruments fulfill all relevant governmental regulations?

Anton Paar viscometers and rheometers are fully compliant with all regulations of 21 CFR Part 11 and provide full data integrity (based on ALCOA principles). You can rely on features such as password access and password complexity requirements, audit trail, electronic signatures, customizable users/user groups, external storage via automated LIMS bridge, and many more.

According to pharmacopeial chapters (USP 912, Ph. Eur. 2.2.8/2.2.10, JP XVII 2.53 (2.1.2), ChP 0633, IP 2.4.28), I need to measure with a Brookfield-type viscometer. Does this mean I only have the option of choosing a Brookfield device or do I have any other possibilities?

The rotational viscometer ViscoQC is compliant with the same pharmacopeial chapters Brookfield-type viscometers are compliant with. ViscoQC is the ultimate solution if you need to be compliant and additionally benefit from a wide range of superior features for fully traceable results, for example automatic spindle and measuring system recognition as well as automatic alignment check.

I need more than just an instrument. Support in the forms of installation, service, and application expertise is essential to me. Does Anton Paar offer that?

Yes, Anton Paar provides instrument qualification documents and service. Anton Paar's unique pharma qualification service helps you save enormous amounts of time and money during instrument qualification and also supports you in the course of the yearly audit process by FDA. Furthermore, you benefit from a global application and service network, broad application knowledge, and local support in the regional technical centers.

For research & development I need an instrument that can be combined with advanced measuring technologies. What possibilities do I have?

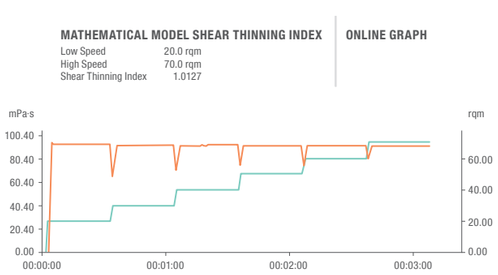
Anton Paar rheometers provide a high level of modularity and employ measuring techniques such as powder rheology, dynamic mechanical analysis, structure analysis supported by microscopy, Raman spectroscopy, and many more. With a wide range of accessories, external influences such as temperature, humidity, pressure, etc. can be simulated and applied to the material during measurement.

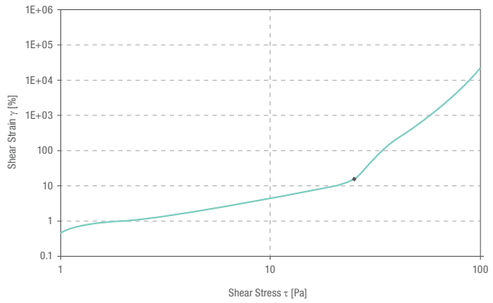
The whole world of viscometry and rheometry

	ViscoQC 100	ViscoQC 300	RheolabQC	MCR 72	MCR 92	MCR 102, 302, 502	MCR 702 MultiDrive
Description	Single-point dynamic viscosity of liquids: from infusions to ointments	Multi-point dynamic viscosity of liquids: from infusions to ointments	Rotational rheological tests: from liquid-like emulsions to semi-solid lotions	Rotational rheological tests with cup-and-bob, plate-plate, and cone-plate measuring systems for liquid to semi-solid samples	Rotational and oscillatory rheological tests with cup-and-bob, plate-plate, and cone-plate measuring systems – for almost all kinds of samples	Investigations of the viscoelastic properties of raw materials, formulations, and final products from QC to R&D	Complete material characterization in research and development
Toolmaster™*	✓	✓	✓	✓	✓	✓	✓
21 CFR Part 11 compliance	✗	✓	✓	✓	✓	✓	✓
Additional features		LIMS functionality for data processing		LIMS functionality for data processing			
		Bar code option for sample identification		Bar codes in measurement reports and LIMS functionality for easy further data processing			
	Digital leveling function		Definition of customized SOPs	Definition of customized SOPs			
Available documentation	PQP-S	PQP		PQP/PQP-S			
Pharmacopeias	USP <912> | Ph.Eur. 2.2.8, 2.2.10 | JP XVII 2.53			USP <912> | Ph.Eur. 2.2.8, 2.2.10 | JP XVII 2.53			

*for automatic tool recognition and configuration to ensure easy handling and minimize user errors

Typical measurements in the pharmaceutical industry





Rotational viscometers

The **viscosity of pharmaceutical liquids from infusions to ointments** can be checked with a rotational viscometer according to pharmacopeial methods (see previous page). With such a test the viscosity of, for example, cough syrup during swallowing or at rest in the bottle can be determined.

The cough syrup shows a speed-dependent shear thinning index of approx. 1, which means that the sample shows so-called “Newtonian” behavior. This means that the sample’s viscosity does not change even if a higher speed is applied e.g. during swallowing. The viscosity of the syrup during swallowing should be as high as possible and should not decrease so that it flows slowly through the digestive tract and stays long on the affected area in the throat. Only cough syrup which stays long on the affected area in the throat has a soothing effect by increasing the moisture.

Rotational rheometers

The **yield point of pharmaceutical liquids and solids** can be checked with a rotational rheometer according to pharmacopeial methods (see previous page). With such a test, for example, the force needed to squeeze the microemulsion out of the tube can be analyzed. Determining the yield point by measuring a flow curve in controlled shear stress mode can simulate the application at hand very well.

Up to a certain shear stress the relationship between shear strain γ and shear stress τ is constant, representing the range of elastic deformation. At the end of this range, irreversible deformation occurs with an increasing shear load which results in the sample flowing and thus a steeper slope of the curve. To determine the yield stress on the log γ / log τ diagram, the bend in the measuring curve is analyzed with the help of two tangents applied on the two slopes.

Rotational and oscillatory rheometers

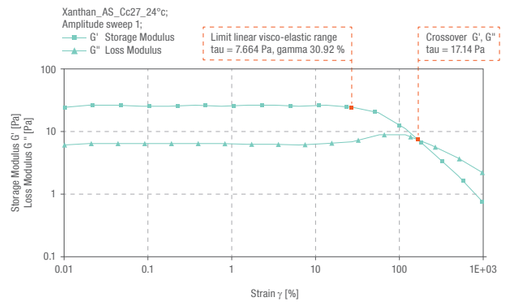
a With standard oscillatory tests you can detect whether your sample is a liquid or a gel at rest. This means you can check the **stability and pumpabilty of xanthan gels**, for example. A typical test is an amplitude sweep, where G’ (elastic part) and G” (viscous part) of a sample are measured.

b Another possibility is a **storage stability** test with a frequency sweep as small frequencies represent the long-term behavior of a sample. Here L1 is stable as it shows G’ above G” all the time, so it is a gel; L2 is instable over time as it shows a cross-over point at small frequencies indicating a liquid-like behavior of the material in the long term which may result in separation or sedimentation.

c Another case in which oscillatory rheology can help you is to check the **thermal stability**. Your sample is heated and cooled in cycles during the measurement. A change in rheological properties (here G’) might show instabilities of sensitive samples.

d With a rheometer with two drives in action you can also test the **droplet stability of an emulsion** by creating a stagnation plane, as the upper and lower drive rotate in different directions. There is a sheared yet not moving area of the sample where you can look inside using a microscope to visualize the behavior of droplets in an emulsion.

a



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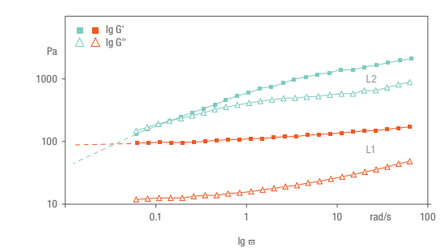

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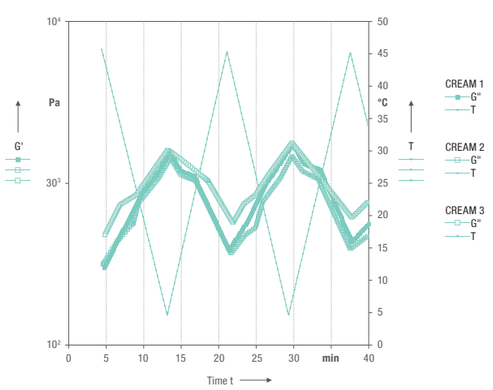

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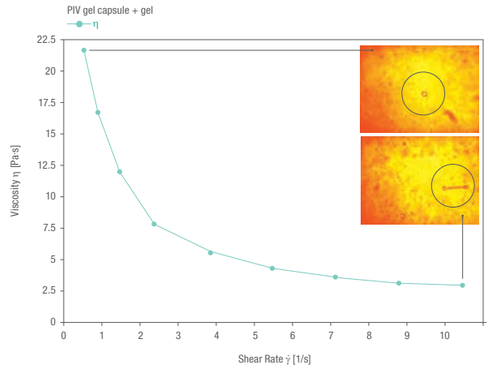

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