

Solutions for polymer films



Surface
characterization



Surface characterization methods for polymer films

	CHALLENGE	SOLUTION	YOUR BENEFITS
THIN FILMS	Checking the real nanostructure for the next production steps.	Perform topography measurements with AFM.	Getting real topography information on the sub-nanometer scale.
	Checking the mechanical properties for material qualification.	Perform force distance curves with AFM.	Getting quantitative values of the elastic modulus.
	Quantification of the mixture ratio of different polymers on thin films.	Perform tapping mode or CRAI mode measurements showing the distribution of different polymers, get the mixture ratio from analyses with Tosca.	Seeing the distribution of different polymers on the nanometer scale, quantification of the mixture ratio for optimal material characterization.
THICK FILMS	The produced film has low surface quality (rippled surface).	Perform rheological measurements to characterize the viscoelasticity of the used raw material in order to optimize processing conditions.	Consistent quality of the produced films, without surface imperfections or defects.
	The packaging film shows increased failure rates in tropical/arid/cold climates.	Characterize the mechanical performance of the film in controlled-humidity DMA tests.	Being sure that your product reaches your customer in good condition, independent of climate conditions.
	The film ruptures during use.	Perform tensile testing to determine the strain- or stress at break. Perform dynamic mechanical analysis to investigate film brittleness (as indicated by the measured damping factor).	Improved product quality based on a better selection of materials tailored to the product requirements.
	The paint scratches too easily.	Perform precisely controlled scratch tests to measure the scratch resistance.	Feedback about scratch resistance of paints with new formulations.
	The polymer films and paints don't recover after scratch damage.	Perform precisely defined scratch tests to measure the depth during scratching and the depth after recovery.	Ability to test different films and coatings and optimize the formulation to achieve the best recovery of the paint or the film after scratch damage.
	The polymer film/paint does not resist aging.	Perform indentation measurements with a hold segment to measure the creep properties of the film/paint.	Possibility to rank different films/paints according to their creep properties and select the best ones.
	The produced film has insufficient optical quality (high variation in dispersion).	Perform refractive index measurements at different wavelengths and determine the dispersion.	Consistent quality of the produced films. Shallow polymers can be already sorted out during the development of new products.
ADHESIVE FILMS	Adhesive residues remain on the surface after the adhesive tape is peeled off (incompletely cured adhesive layer).	Investigate the aging behavior of the adhesive as a function of temperature and time with rheological measurements and DMA tests.	Higher product quality due to optimized material formulations and processing conditions.
	The tape comes off too easily at certain temperatures.	Perform DMA tests to examine the influence of the temperature on the viscoelastic properties of the adhesive film.	Evaluate the suitability of the adhesive tape for a specific application and a certain temperature range.
	Non-uniform adhesion strength of the sticky tape.	Use AFM to determine the maximum adhesion forces and perform morphology characterization on the nano-scale.	Highly precise characterization of material properties on the nano-scale and evaluation and comparison of the adhesion strength of different tapes for uniform product quality.
	New adhesive materials need to be developed or characterized.	Perform force curve measurements with an AFM for quantitative adhesion force analysis.	Faster development cycles to reach target specifications.



Rheology & DMA

MCR Evolution rheometers are ideal for optimizing production processes as well as for quality control of films and adhesive films using one single versatile instrument. With proper rheological characterization, well-founded material selection and process improvement according to scientific principles can be ensured. With a rheometer that is also a Dynamic Mechanical Analyzer mechanical properties of the final product that depend on environmental conditions such as temperature or humidity can be analyzed as well.

Parameters:

Loss factor | Loss modulus | Storage modulus | Friction | Melting temperature | Glass transition temperature | Molar mass distribution | Tackiness | Complex modulus | Complex viscosity | Viscoelastic properties | Creep | Relaxation behavior

Atomic force microscopy

The AFMs of the Tosca Series are the perfect tools for analyzing surface topographies and material characteristics on the nanometer scale. Especially for developing new polymer films, the distribution of the different polymer mixtures and their mechanical properties are needed to understand their functional behavior. Understanding this behavior in the nanometer regime allows for drawing direct conclusions about their behavior in the μm range or even higher. In this way it is possible to develop new materials for industry and other sectors.

Parameters:

Roughness | Stiffness | Real 3D topography | Mechanical and electrical properties on the nanometer scale

Mechanical surface characterization

Scratch testing is used to characterize material properties like scratch resistance of surfaces and adhesive strength of film-substrate systems by using a variety of complementary test methods. This makes scratch testers invaluable tools for quantifying scratch resistance, mar resistance, and adhesion of coatings for research, product development, and quality control. While the Nano Scratch Tester NST³ is particularly suited for characterizing surfaces and organic or inorganic coatings as well as soft or thin films with a typical thickness below 1000 nm, the Micro Combi Tester MCT³ is a universal measurement head for full mechanical characterization of coatings and bulk samples with a typical coating thickness between 1 μm and 20 μm .

Parameters:

Coating adhesion | Scratch resistance | Mar resistance | Elastic recovery | Elastic modulus | Creep | Viscoelastic properties

Optical surface analysis

One of the most important optical parameters for characterization and quality control of modern high-tech polymer films and coatings is the refractive index, which influences the refraction of light when passing through the material. Especially polymers used for smartphone or TV screens need a defined refractive index and dispersion to guarantee the highest resolution and greatest color range. The Anton Paar refractometer Abbemat provides the highest precision of refractive index measurement and the Abbe number for dispersion.

Parameters:

Refractive index | Abbe number



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We are confident in the high quality of our instruments. That's why we provide **full warranty for three years.**

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Effective January 1, 2020, all new instruments* include repair for 3 years.

You avoid unforeseen costs and can always rely on your instrument.

Alongside the warranty we offer a wide range of additional services and maintenance options.

*Due to the technology they use, some instruments require maintenance according to a maintenance schedule. Complying with the maintenance schedule is a prerequisite for the 3-year warranty.

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Regardless of how intensively you use your instrument, we help you keep your device in good shape and safeguard your investment – including a 3-year warranty.



THE SHORTEST RESPONSE TIMES

We know that sometimes it's urgent. That's why we provide a response to your inquiry within 24 hours. We give you straightforward help from real people, not from bots.



CERTIFIED SERVICE ENGINEERS

The seamless and thorough training of our technical experts is the foundation of our excellent service provision. Training and certification are carried out at our own facilities.



OUR SERVICE IS GLOBAL

Our large service network for customers spans 86 locations with a total of 350 certified service engineers. Wherever you are located, there is always an Anton Paar service engineer nearby.

