Solutions for Polymer Films

Anton Paar

Surface Characterization

Surface Characterization Methods for Polymer Films

CHALLENGE	SOLUTION	YOUR BENEFITS
The polymer films and paints must recover after scratch damage.	Perform precisely defined scratch tests to measure the depth during the scratch and the depth after the recovery.	Testing different films and coatings, and optimizing the formulation to achieve the best possible recovery of the paint or the film after scratch damage.
The polymer thin film does not show antibacterial behavior.	Analyze the surface zeta potential at various pH values to gain knowledge of the isoelectric point.	Detection of the proper material composition that exhibits antibacterial behavior.
The interaction between a polymer thin film and an aqueous solution needs to be predicted.	Analyze the surface zeta potential to find out whether molecules of the liquid adsorb on the surface or whether components of the thin film get eluted.	Access to a surface-sensitive technique that lets you analyze the real-life sample.
The film does not exhibit the desired wetting behavior.	Analyze the surface zeta potential to gain knowledge of the surface functionalities.	The option to adjust the properties to get a film with the desired wetting behavior.
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 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.

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

Surface zeta potential analysis

Surface zeta potential analysis gives insights into the surface chemistry of materials. With SurPASS 3, all information can be obtained from real-life samples since the broad range of measuring cells makes using model surfaces superfluous. The information provided includes the charging behavior of a surface when in contact with an aqueous solution, the presence of specific functional groups on the surface, the success and reproducibility of surface modifications, and the adsorption and desorption behavior of additives on the surface.

Parameters:
Solid surface zeta potential | Isoelectric point | Liquid-on-solid surface adsorption kinetics

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 NST^3 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 MCT^3 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

Anton Paar
Certified Service

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

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All new instruments* include repair for three years.
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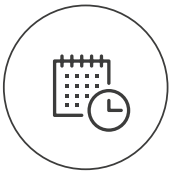

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