Anton Paar

SurPASS

Electrokinetic Analyzer for Solid Samples

::: Innovation in Materials Science

SurPASS
For Solid Surface Analysis

The SurPASS electrokinetic analyzer helps scientists in the fields of chemistry and materials science to improve and adjust surface characteristics and to design new specialized material properties e.g. for polymers, textiles, ceramics, glass or surfactants.

This instrument enables the investigation of electrokinetic effects at the solid/liquid interface for solids of almost any size and shape.

By measuring the streaming potential or streaming current of macroscopic solids, the SurPASS provides the zeta potential as the primary information.
The zeta potential is an interfacial property that is of great importance for understanding the behavior of solid materials in many technical processes. It gives insight into the charge and adsorption characteristics of solid surfaces.

The SurPASS extends your knowledge in interface analysis!

Longstanding experience

The SurPASS electrokinetic analyzer introduces a state-of-the-art tool for solid surface characterization.

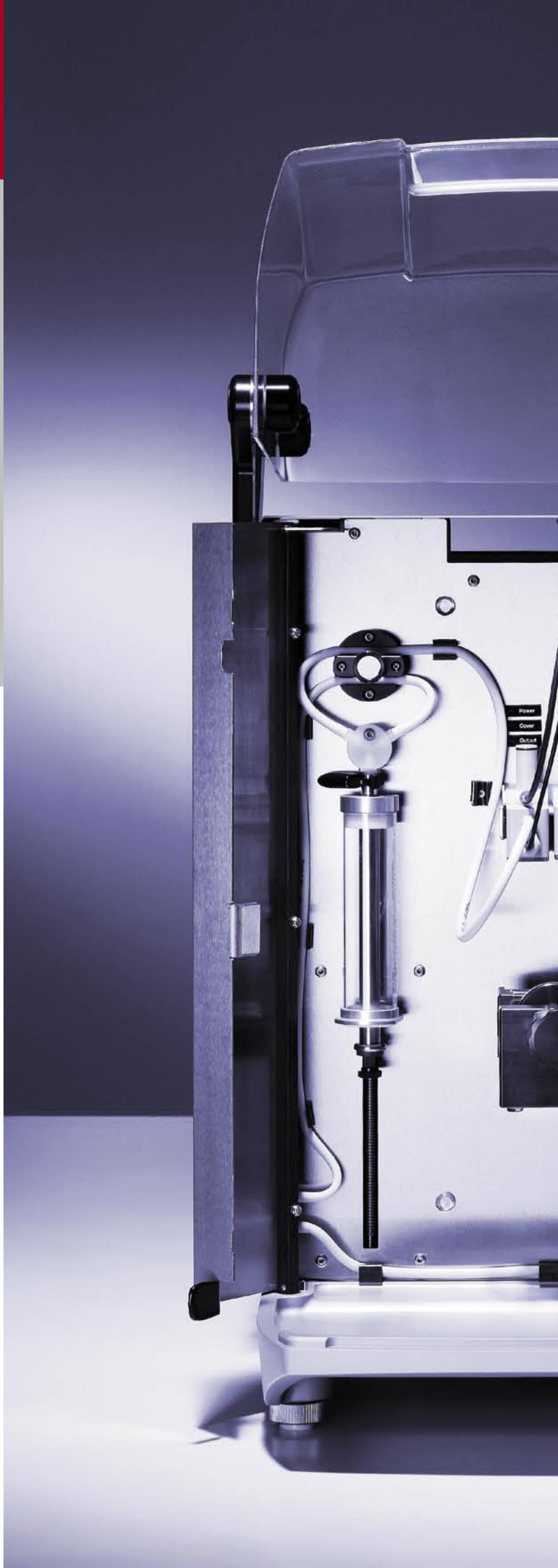
Many years of experience with the streaming potential technique at Anton Paar and our close cooperation with the Leibniz Institute of Polymer Research Dresden have resulted in this new instrument.

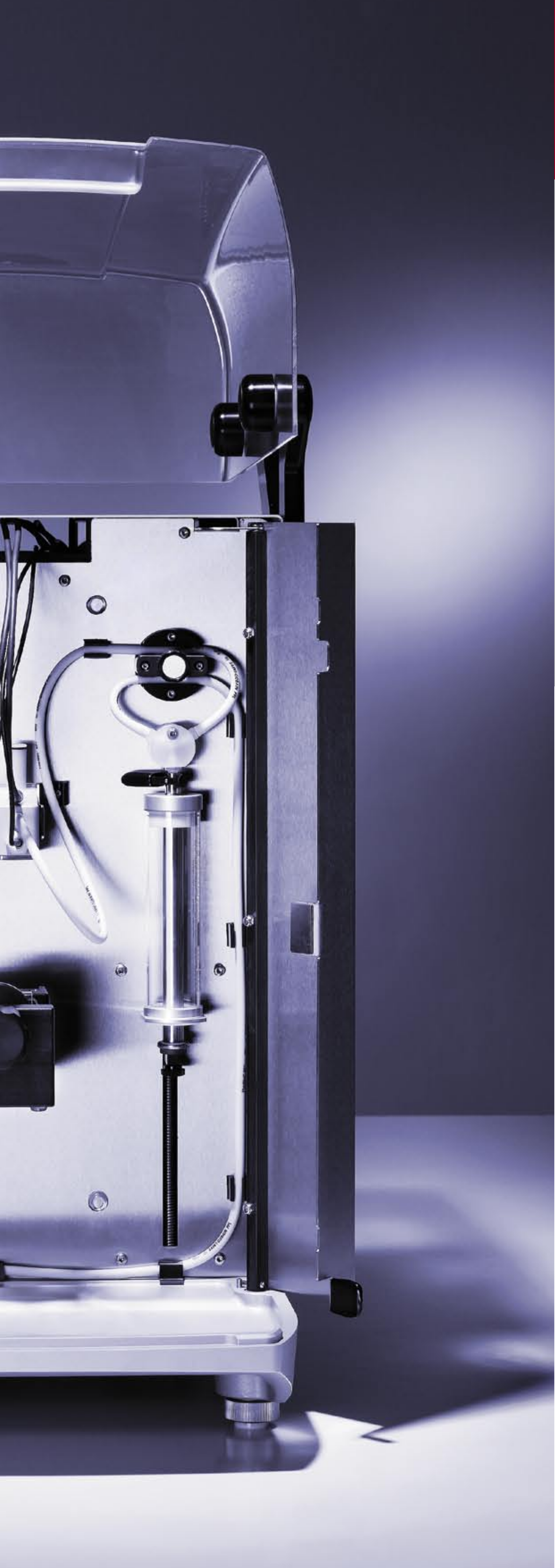
The well-engineered electrolyte circulation, the elaborate electronics concept and the easy-to-use and rugged measuring cells provide a user-friendly platform for advanced surface analysis.

Repeatable – reproducible – reliable

The separation of the measuring liquid from the external electrolyte supply together with a high-precision measurement of streaming potential, streaming current, and cell resistance are crucial for the excellent measuring sensitivity.

Integrated routines for plausibility checks increase the reliability of the measuring data.





High-End Accessories

Flexible and outstanding – The Clamping Cell

The Clamping Cell is the tool of choice with the SurPASS for measuring planar surfaces like foils, polymer sheets, membranes, metals, ceramics or glass.

Two different arrangements of planar samples are possible: In the symmetric configuration two identical surfaces are mounted and separated by a well-defined gap. The asymmetric geometry uses a reference surface and enables the non-destructive measurement of samples with different thicknesses.

A proprietary mechanism guarantees a specified contact pressure and thus a highly reproducible sample mounting.

Easy handling – The Cylindrical Cell

The Cylindrical Cell is mainly used for the investigation of natural or technical fibers, granular samples, and coarse particles. Easily mounted accessories extend the range of applications to fine powders with a particle size down to 25 µm.

A unique sensor design common to both measuring cells ensures a precise streaming potential/current detection and a reliable pressure measurement.

Fully automated measurement – The Titration Unit

With the integrated Titration Unit the zeta potential can be determined fully automatically depending on the pH value or additive concentration in the electrolyte. Two stepper motor-driven syringe pumps facilitate high-resolution dispensing of liquids such as acidic or alkaline solutions. The innovative cover for the external electrolyte beaker completes the high-precision titration system.

Safe operation

User safety is one of Anton Paar's major concerns. Safety switches and an automated locking of movable parts in case of an unforeseen incident are integral components of the SurPASS.

Besides its use for operator protection the widely visible cover hood has also become an indispensible design element.

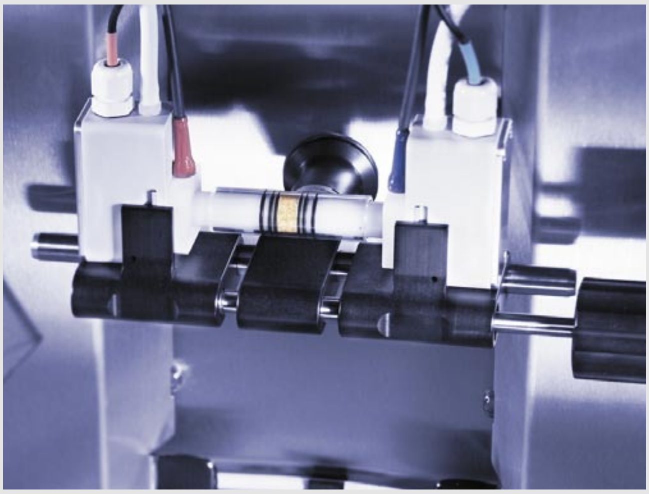
Measuring Principle

The SurPASS approach

Zeta potential determination with the SurPASS is based on the measurement of streaming potential and streaming current.

A dilute electrolyte is circulated through the measuring cell containing the solid sample, thus creating a pressure difference. A relative movement of the charges in the electrochemical double layer occurs and gives rise to the streaming potential. This streaming potential – or alternatively the streaming current – is detected by electrodes placed at both sides of the sample.

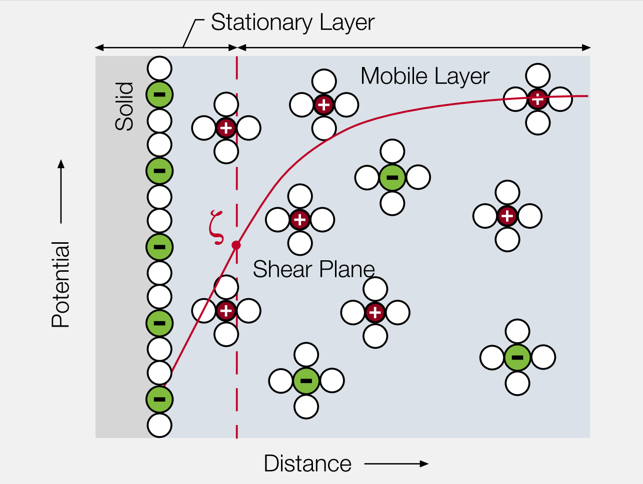
The electrolyte conductivity, temperature and pH value are determined simultaneously.



The electrochemical double layer

The interface between a solid surface and a surrounding liquid shows a charge distribution which is different from the solid and liquid bulk phases. In the model of the electrochemical double layer, this charge distribution is divided into a stationary and a mobile layer. A plane of shear separates these layers from each other. The zeta potential is assigned to the potential decay between the solid surface and the bulk liquid phase at this shear plane.

The application of an external force parallel to the solid/liquid interface leads to a relative motion between the stationary and mobile layers and to a charge separation which gives experimental access to the zeta potential.



VisioLab for SurPASS

VisioLab for SurPASS is a Microsoft Windows®-based control and evaluation software which collects all measured parameters. It automatically calculates the zeta potential and displays the results both as graphs and tables.

User-friendly

The intuitive design and the menu-driven architecture of the graphical user interface make this software easy to understand and straightforward to apply. VisioLab for SurPASS enables evaluation of multiple data files simultaneously and is therefore a powerful analysis tool.

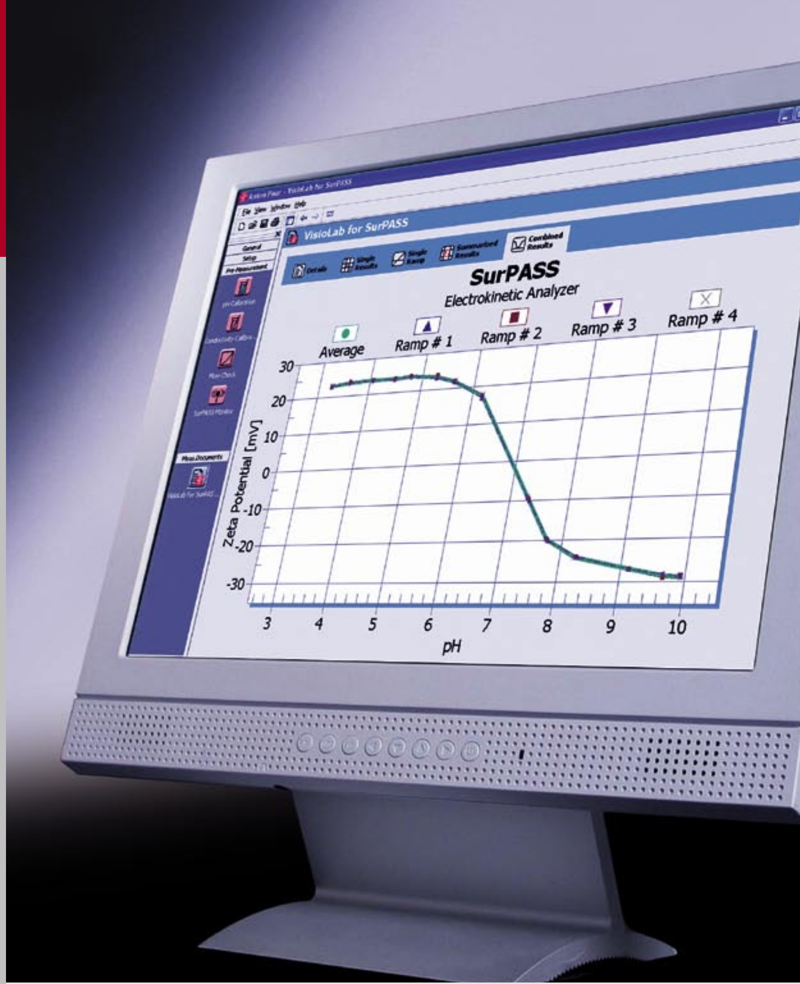
Fully automatic data acquisition

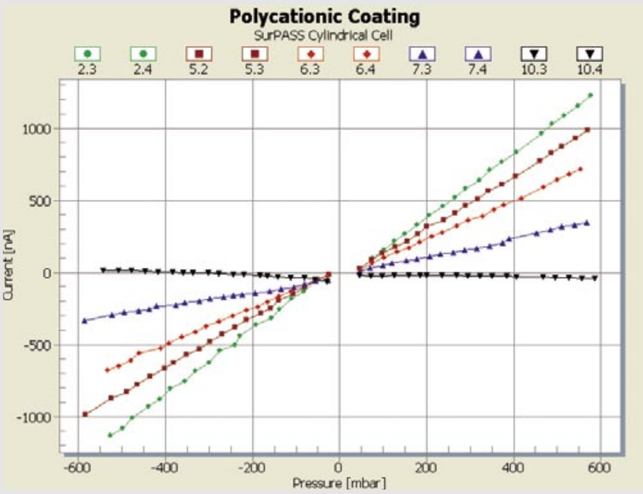
Preparation for measurement requires only a small number of parameter settings. Streaming potential or streaming current is measured continuously with increasing pressure difference. Several measured quantities are permanently accessible.

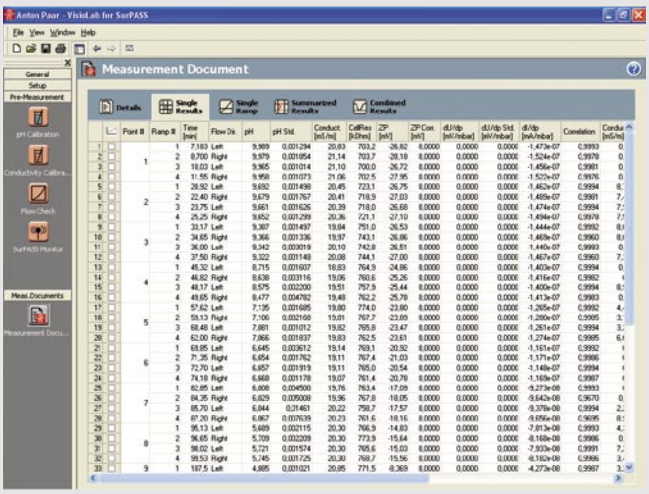
Template files simplify SurPASS operation and reduce operator time.

Versatile and clear

The VisioLab for SurPASS software includes features for customizing the data display in tables and diagrams, enabling complete measurement reporting. In addition, all measured results may be exported for further analysis and data processing.

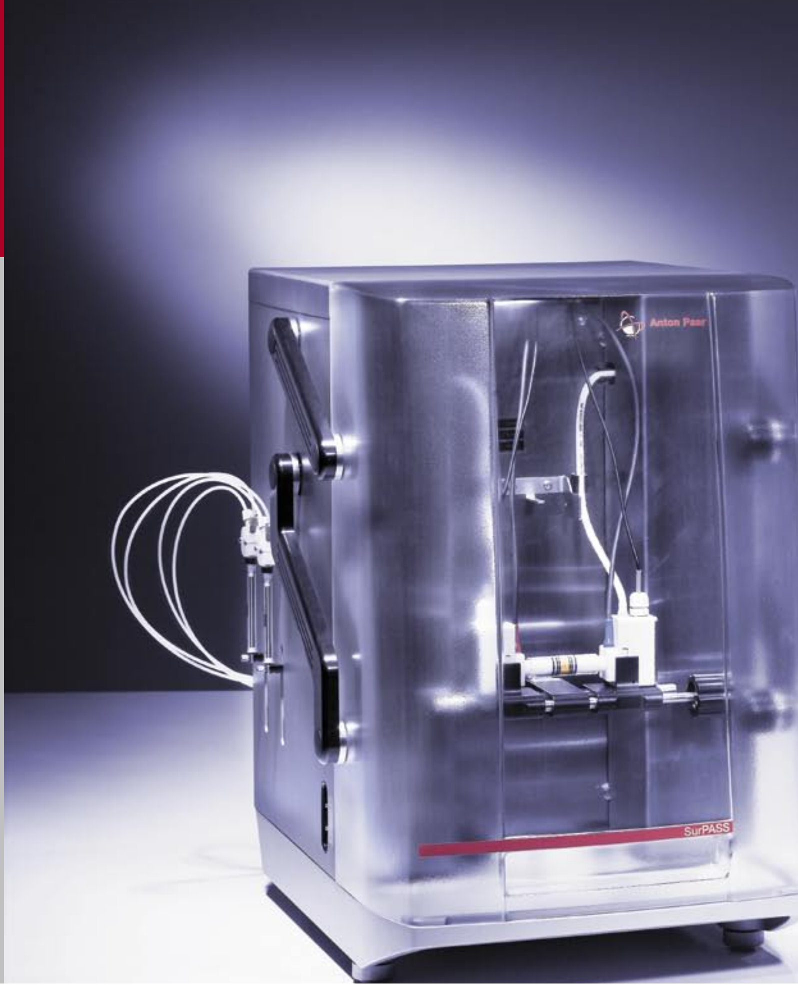






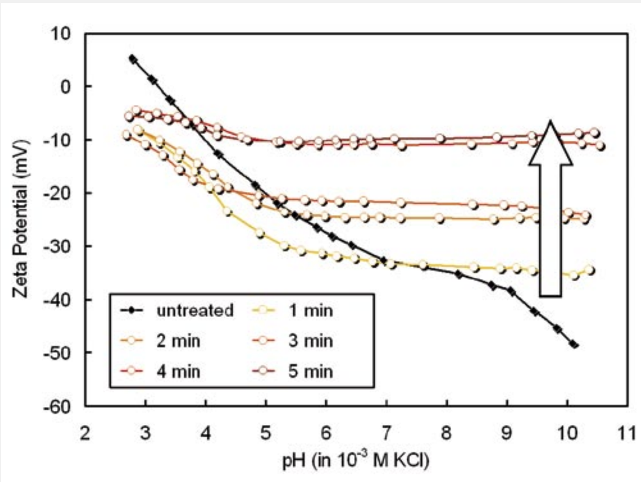
Applications

- Membranes and filters
- Polymers and composites
- Semiconductor industry
- Biomaterials
- Synthetic and natural fibers and textiles
- Cosmetics and surfactants
- Mineral powders
- Pulp and paper
- Printing, paint, and varnish industry



Why does an inert polymer surface become printable?

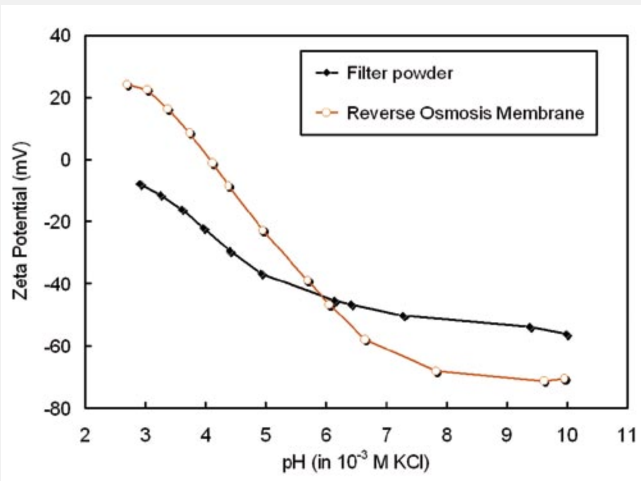
Surface modification of polymers is essential to improve wettability, paintability, biocompatibility, or adhesion to other polymers and metals. The aim of such surface treatment is to introduce polar groups onto the polymer surface. Zeta potential measurement is a powerful technique for characterizing and monitoring the degree of surface modification.



Increasing hydrophilicity of a polyethylene foil with photochemical treatment time

When is a filter due for cleaning?

Fouling is a limiting process in the application of membranes for water treatment. The zeta potential reflects the effect of foulants, such as divalent cations or anions and humic acid, on the membrane surface. The due date for membrane cleaning can be determined as well as the efficiency of surface modification. This reduces fouling and extends the membrane lifetime.



Surface characterization of a polymer composite reverse osmosis membrane and an inorganic filter powder

Research Topics

- Chemical and physical surface modification
- Coating and adhesion
- Biocompatibility testing
- Adsorption studies and monitoring

Measuring range	Streaming potential	– 2000 .... + 2000 mV
	Streaming current	– 200 .... + 200 μA
	Cell resistance	5 Ω ....20 MΩ
	Pressure measurement	– 1000 .... + 1000 mbar
	pH value	pH 2 .... pH 12
	Conductivity	1 .... 1000 mS/m
	Temperature	10 .... 40 °C
	Flow rate	max. 500 mL/min
Sample size requirement	Clamping Cell	min. 55 mm x 25 mm
	Cylindrical Cell	particle size > 25 μm
Mains supply	AC 100…240 V, 50…60 Hz, 200 VA	
Dimensions	540 mm x 430 mm x 593 mm (D x W x H) Footprint: 640 mm x 630 mm (D x W), Clearance: 910 mm	
Weight	44 kg	
Software requirements	Microsoft Windows® 2000, XP Pentium III or compatible at 1 GHz or better min. 256 MB RAM, 200 MB free disk space RS 232 interface or USB/RS 232 converter	