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Quantachrome®

Renowned innovator of ideas for today's porous materials community.

For over 43 years, Quantachrome's scientists and engineers have revolutionized measurement techniques and designed instrumentation to enable the accurate, precise, and reliable characterization of powdered and porous materials:

- Gas Sorption Isotherms
- Surface Area
- Pore Size, Pore Size Distribution
- Porosity, Pore Zeta Potential
- Chemisorption, TPR/TPO/TPD
- Water Sorption Behavior
- True Solid Density
- Tapped Density



Quantachrome Instruments' quality management system is certified to be in accordance with ISO9001:2008.

Not only are Quantachrome products the instruments of choice in academia, but the technology conceived and developed by our expert staff is applied in industrial laboratories worldwide, where research and engineering of new and improved porous materials is ongoing. Manufacturers also rely on porous materials characterization technology to more precisely specify bulk materials, to control quality, and to isolate the source of production problems with greater efficiency.

Quantachrome is also recognized as an excellent resource for authoritative analysis of your samples in our fully equipped, state-of-the-art powder characterization laboratory, LabQMC (www.labqmc.quantachrome.com, qc.lab@quantachrome.com).

Serving Porous
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Characterization
Needs Since 1968



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QUANTACHROME



3805 | 2305 | 1905

electroacoustic and conductivity pore analyzers

3805 electroacoustic pore analyzer

2305 porosity and pore zeta potential analyzer

1905 rapid porosity analyzer

PORE SIZE
POROSITY
PORE ZETA POTENTIAL

WAVE 3805 | 2305 | 1905



WAVETM

3805 | 2305 | 1905



CAPABILITIES

The **WAVE series** of pore characterization systems consists of three models. The **WAVE 3805** can measure all three pore-related properties from a single control module using two probes. Pore size analysis and three-in-one capability of the **3805** represents the newest, and probably the most unique, in pore characterization systems.

The **WAVE 2305** offers measurement of pore zeta potential and porosity.

The **WAVE 1905** is dedicated to the rapid determination of just porosity for those customers who are most interested in that parameter.

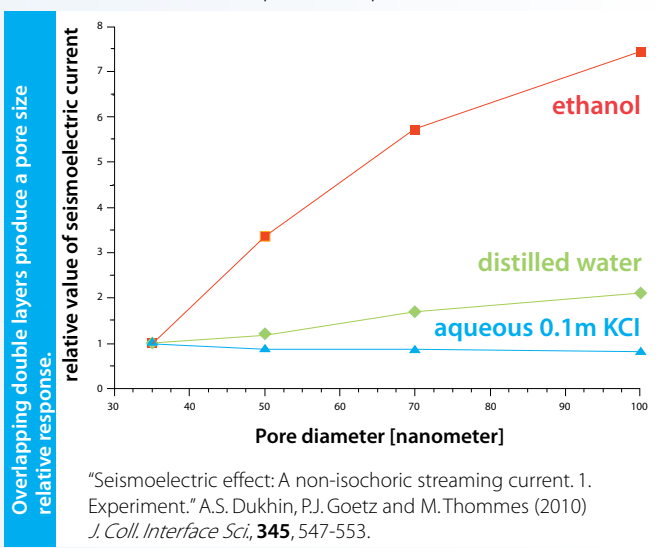
	Mean Pore Size	Percent Porosity	Pore Zeta Potential
WAVE 3805	✓	✓	✓
WAVE 2305	—	✓	✓
WAVE 1905	—	✓	—

INTRODUCTION

Many applications require rapid evaluation of **pore size** and **porosity**. A number of existing techniques are available for pore size measurement but might require many hours, cryogenic coolants and vacuum systems (gas sorption) or mercury and high pressures (mercury intrusion porosimetry), or are restricted to through-pores (porometry).

But now, the technique of **electroacoustics** is available for the rapid determination of **mean pore size**¹ in a variety of sample types - without mercury, without vacuum pumps, without pressurized gases, and without the wait.

The fundamental method behind the mean pore size measurement is called the seismoelectric effect. An applied ultrasonic pressure wave causes the so-called electrical “double-layer” at the interface between the surface and a suitable liquid (i.e. low conductivity, for example water, polar or non polar organic) to shear, resulting in an oscillating current. When double layers overlap in pores, the seismoelectric effect depends on pore width.



The same seismoelectric effect is also employed to reveal the **zeta potential** of the surface inside the pore structure¹. Propagation of ultrasound through a porous body creates motion of the given liquid, in this case one of high conductivity (to create *isolated* double-layers) inside of the pores relative to the solid matrix. This, in turn, causes relative motion of charges that are located in the diffuse layer and on the pores’ surfaces. This is expressed as an oscillating electric current called the *Streaming Vibration Current*.

The measurement of **percent porosity** uses very high frequency conductivity measurements². And unlike direct current conductivity measurements, the high frequency oscillating current reveals the porosity of all pores - including dead-ended (blind) pores - not just those that form a connected pathway on a macroscopic scale.

¹ Patent Pending: A1 20110283800 “Method for determining porosity, pore size and zeta potential of porous bodies”

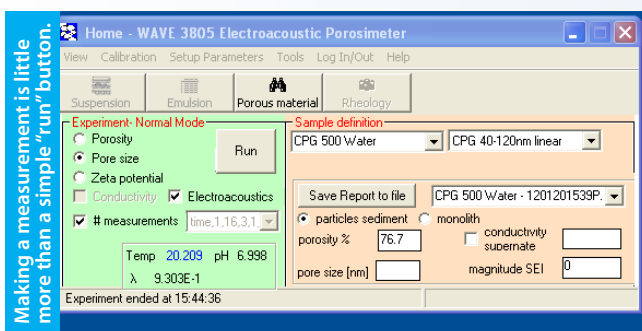
² Patent Pending: A1 20110012627 “Method for determining porosity with high frequency conductivity measurement”

WAVE

3805 | 2305 | 1905

MEASUREMENTS

All measurement modes are performed in a similar fashion, that is, the sample is fully wetted with a suitable fluid (water, organic solvent or electrolyte depending on the exact measurement to be done and pore size range of the sample) and then contacted by the appropriate probe (the probes can be used in any orientation to facilitate ease of use). The electronics and measuring circuits do the rest. Results are displayed on screen in a minute or two and saved to the database.



APPLICATIONS

There is no fundamental limitation as to the type of material that can be analyzed using the WAVE analyzers so long as the sample is stable with respect to the fluid used to wet the pores, and for pore size that they are within the range of the technique.

Typical applications include green and fired ceramics, core samples, chromatography silicas and resins, tablets, battery components, friction products, frits, cement and other construction materials, to name but a few.



SPECIFICATIONS

MEAN PORE SIZE	3805
Measuring principle	Electroacoustics (seismoelectric effect)
Mean pore size (min)	~10nm
Mean pore size (max)	>5 μm (5000nm)
Repeatability	<1%

POROSITY	3805	2305	1905
Measuring principle	Conductivity (very high frequency)		
Porosity (resolution)	0.5%		
Porosity (accuracy)	<10%		
Repeatability	<1% absolute		
Conductivity	0.001-10 S/m, ± 1%		

PORE ZETA POTENTIAL	3805	2305
Measuring principle (zeta potential)	non-isochoric streaming current (seismoelectric effect)	
Zeta potential (min)	±0.1 mV	
Zeta potential (max)	no restriction, + or -	
Zeta potential (resolution)	±(0.1 + 0.5%)	

PHYSICAL	3805	2305	1905
Height	21cm (8.5 in)		12.5cm (4.5 in)
Width	33cm (13 in)		21cm (8.5 in)
Depth	41.5cm (16.5 in)		26cm (10.5 in)
Weight	20kg (44 lbs)		4kg (9 lbs)

ELECTRICAL	Universal input
Voltage	100-240 VAC
Frequency	50/60 Hz

SOFTWARE

The WAVE analyzers are supplied with Windows®-based software for control, data acquisition and report generation, and which runs on the control module so a separate PC is not required. The WAVE software features an easy-to-use interface, prompted calibration procedures, a defined-materials database and real-time data capture. Data are stored in database format and can be output in popular .csv format.