

THE PMI LIQUID - LIQUID POROMETER



Not just products...*solutions!*

Application

Designed for pore structure characterization of materials such as membranes, filter media, ceramics, paper, textile, etc., having very small pore sizes. It is capable of measuring pore diameters, pore distribution and liquid flow rate of materials having very low permeability.

Principle of Porometry

A wetting liquid spontaneously fills the pores of the material. Two immiscible wetting liquids are selected. Liquid 1 with lower surface tension is used to fill the pores of the sample. Liquid 2 is added to the top of the sample and is pressurized to displace the first from the pores and flow through the empty pores. The flow rate of Liquid 2 is also measured without wetting the sample with Liquid 1. The pore diameter is related to the surface tension of the two liquids. The flow rates yield pore distribution and liquid permeability.

$$D = 4 \gamma_1 \cos \theta_1 / p$$

Where:

D = pore diameter

γ_1 = Interfacial surface tension of liquids

$\cos \theta_1$ = contact angle of liquid 1 on pore surface

p = differential pressure applied on the sample by liquid 2

Test Procedure

Two immiscible & saturated wetting liquids such as silwick and alcohol are taken. Pores are filled with silwick and alcohol is pressurized to displace the silwick and flow through the pores. The amount of liquid flowing out is measured in balance. Alcohol flow rate and differential pressure are measured. Because surface tension of silwick and alcohol are low, contact angles are taken as zero. Mean flow pore diameter and pore distribution are computed like CFP.

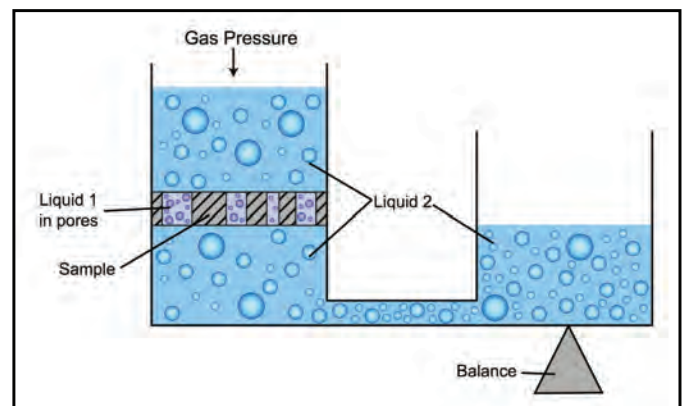


Figure 1

Basic design for analysis procedure

Unique Features

- Pore diameters down to several nanometers are measurable
- Pressures needed are much less than those for capillary flow porometer
- Very low liquid permeability measured
- Fully automated, user friendly operation

Typical Test Results

caprep v 6.71.38 using PMI/APP Graphics v1.8.7

PERMEABILITY RESULTS
12-07-2009

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CORNELL INDUSTRY RESEARCH PARK, BLDG. 4
ITHACA, NY 14850 USA
PHONE (607)-257-5544 or 1-800-TALK-PMI

FOR: DEFAULT

TESTNUMBER: 1
OPERATOR: TLM
LOTNUMBER: MACHINE 1591

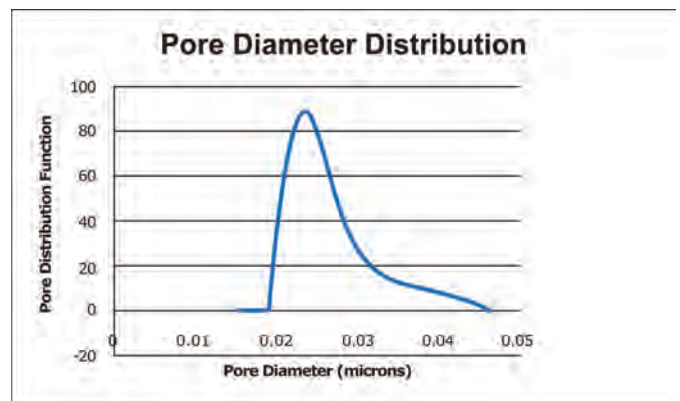
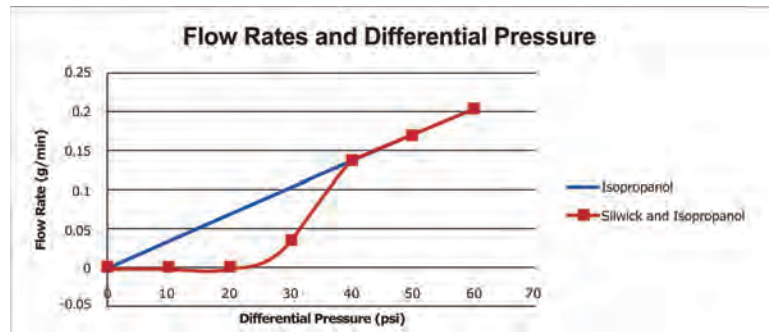
SAMPLE ID: FF1

TIME: 12:17:49
FILE: C:\Documents and Settings\PMI\lab\Desktop\LEP Data Latest\FF1.CFT

SAMPLE THICKNESS : 1.000 mm
SAMPLE DIAMETER : 5.248 mm
FLUID USED : WATER
FLUID VISCOSITY : 1.900 CP

FLOW RATE COLUMNS:
A: Flow in CC/SEC.
B: Specific Flow in LITERS/MIN/CM².
C: Flow in LITER/PSI/CM²/SEC.
D: Flow in LITER/PSI/CM²/MIN.

DIFFERENTIAL PRESSURE PSI	A	B	FLOW RATE C	D	PERMEABILITY DARCYs
.0024137	.0000081	.0000022	.0000155	.0009273	0.043166
2.2096	.0004704	.0001305	9.841E-07	.0000590	.0027487
5.3184	.0003343	.0000927	2.906E-07	.0000174	.0008116
7.8900	.0005099	.0001414	2.988E-07	.0000179	.0008344
11.026	.0007159	.0001986	3.002E-07	.0000180	.0008384
14.143	.0008984	.0002492	2.937E-07	.0000176	.0008202
17.268	.0010517	.0002917	2.816E-07	.0000169	.0007864
20.408	.0011812	.0003276	2.676E-07	.0000161	.0007473
23.524	.0012739	.0003534	2.504E-07	.0000150	.0006992
26.643	.0013755	.0003815	2.387E-07	.0000143	.0006666



Specifications*

Pressure Range: 0 - 500 psi

Pore Size Range: 0.5 - 0.002 microns

Resolution: 1 in 60,000

Flow Resolution: 0.0001 cc/min

Sample Size: 5mm - 50mm diameter foil to 1" thick (others available)

* Other specifications for this machine are available. Specifications are subject to change without notice.



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and reproducible porometers in the world.



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