

# Diffusion Permeameter

## Applications

Many applications of porous materials require very low gas permeability through these materials. Such applications are found in many industries including biotech, healthcare, pharmaceutical, food, packaging, environmental, power sources and chemical industries. Determination of the magnitudes of flow rates of gas through materials used in these applications is important for evaluation of products.



## Principle

The basic principle is based on the laws of diffusion.

$$F = - M [dp/dx]$$

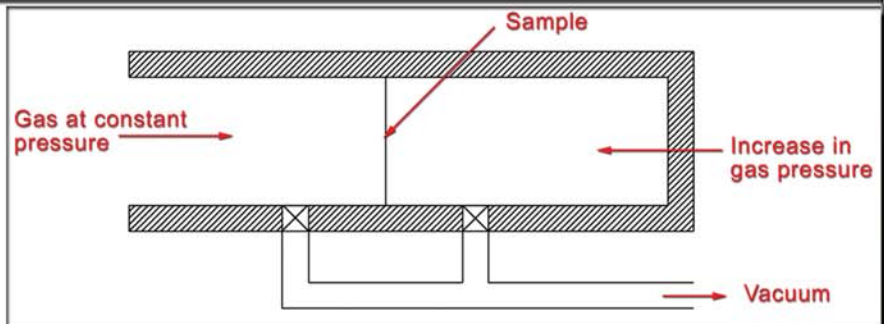
where  $F$  is the flux across the sample,  $[dp/dx]$  is the pressure gradient across the thickness, and  $M$  is a measure of diffusivity. The

instrument is designed to accurately measure pressure and flow rate. The sample chamber is evacuated. Gas pressure maintained at a constant value on one side of the sample is measured and the increase in pressure on the other side is also measured. The data are used to compute flow rate of gas per unit area of the sample per unit time as a function of pressure gradient.

The gas flow rate is computed using the following relation.

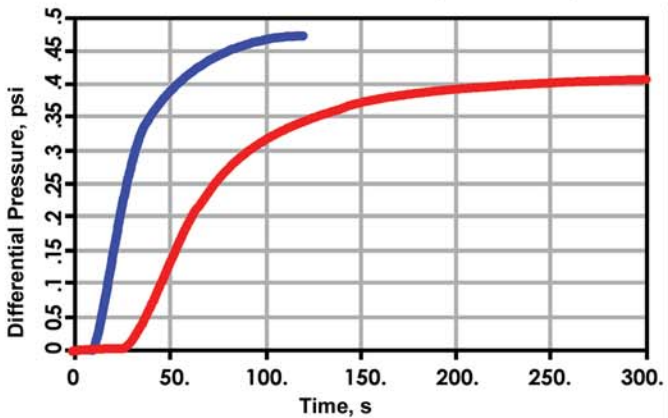
$$F = \left( \frac{V T_s}{P_s T} \right) (dp/dt)$$

where  $F$  is the gas flow rate in volume at STP per unit time,  $V$  is the volume of outlet chamber,  $P_s$  is the standard pressure,  $T_s$  is the standard temperature,  $T$  is the test temperature, and  $(dp/dt)$  is the time rate of pressure increase in the outlet chamber.

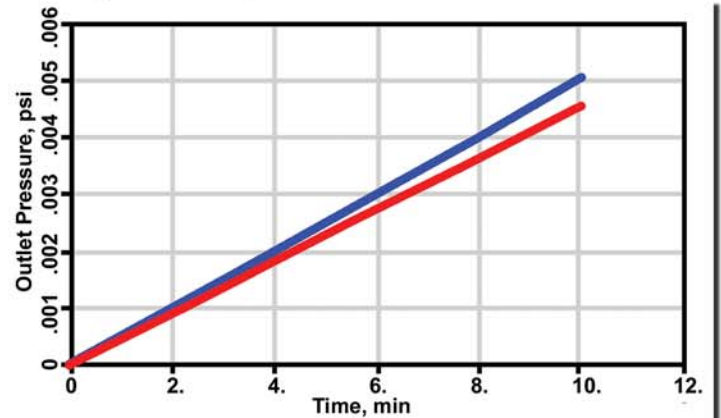


## Capabilities

- ◆ Measures flow rate as low as  $10^{-4}$  cm<sup>3</sup>/s.
- ◆ Elevated operating temperatures up to 800°C.
- ◆ Elevated Pressure tests up to 200 psi.
- ◆ A variety of gases & vapors can be tested.
- ◆ Sample can be tested under compression up to 1000 psi



Vapor Through Nafion Membrane



Air

## Features

- ◆ The sample chamber is maintained at a constant temperature for yielding reliable and reproducible data.
- ◆ Fully automated
- ◆ Very little operator involvement
- ◆ Robust. Minimal maintenance
- ◆ Accuracy of pressure measurement: 0.15% of reading

diffprep v2.1.12 using PMI/APP Graphics v1.8.6

Next Back Print About

Diffusion Permeometer Test  
08-11-2004

Porous Materials, Inc. Analytical Services Division  
20 Dutch Mill Road  
Ithaca, NY 14850 USA  
PHONE 607.257.4267, 257.5544, or 1.800.825.5764  
Email: info@pmiapp.com  
www.pmiapp.com

File Name : \\Fileserver1\labdata\dfpm\pmi\10 micron laser disc.dpd  
Thickness : .078 cm  
Diameter : 1.9 cm  
Gas Name : Helium

Time (min)	P(Inlet) (Torr)	P(Outlet) (Torr)	Temp. (deg C)	Flow scc/s	Permeability Darcys
0.08	997.40	1.09000	23.9	0.03738	2.2087E-05
0.17	995.01	2.16000	23.9	0.03646	2.1651E-05
0.25	992.85	3.26000	23.9	0.03772	2.2495E-05
0.33	990.75	4.33000	23.9	0.03669	2.1975E-05
0.42	988.58	5.39000	23.9	0.03646	2.1933E-05
0.50	986.65	6.46000	23.9	0.03669	2.2158E-05
0.58	984.60	7.51000	23.9	0.03600	2.1858E-05
0.67	982.67	8.58000	23.9	0.03669	2.2339E-05
0.75	980.74	9.63000	23.9	0.03612	2.2077E-05

## Other Products

- ◆ Capillary Flow, QC, In-Plane, Clamp-On, Microflow, Compression, and Cyclic Compression Porometers
- ◆ Bubble Point, Cartridge, and Integrity Testers
- ◆ Liquid Extrusion Porosimeter
- ◆ Liquid/Gas/Vapor Permeameters
- ◆ Envelope Surface Area Analyzers
- ◆ Water Vapor Transmission Analyzer
- ◆ Pycnometers
- ◆ Mercury/Nonmercury Porosimeters
- ◆ BET Surface Area and Pore Analysis Sorptometers
- ◆ Testing Services and Consulting Services

**Sale Rent Lease**

## Porous Materials, Inc.



20 Dutch Mill Road, Ithaca, New York 14850 USA

Toll Free US & Canada: 1-800-TALK-PMI Phone: (607)257-5544

Fax: (607)257-5639 Email: info@pmiapp.com Website: www.pmiapp.com

## PMI Europe

Koningin Fabiolapark 45, BE 9820 Merelbeke, Belgium

Phone: +32 477 79 6011 Fax: +32 9 330 8544 Email: patrice.hellebaut@pmiappeurope.com