AIR PERMEABILITY AND PORE CHARACTERIZATION OF SURGICAL MASK AND GOWNS




Bio aerosols are tiny particles and, therefore, can suspend in the air for a long time. If the particles are pathogenic, they can easily cause different diseases for people, and the risk of these is the outbreak of infectious disease. The hospitals and medical centers are essential places in which there is a high level of bio aerosol. One of the best strategies to care for these people from bio aerosol is to use surgical masks and gowns.

The mean pore size, maximum pore size, pore size distribution, gas permeability, and air resistance of masks has a significant influence on the filtration rate.

POROMETRY:

PMI-Porometer and gas permeation tester allow the Companies and researchers to manipulate the specification of filter, mask, etc. Also, the PMI-Porometer is used for Quality Control and R&D in industries worldwide such as commercial membranes, lab-made electrospun membranes, automotive filters, geotextiles, battery separator woven/nonwovens, ceramics, paper, battery separators & electrodes etc.

PORE STRUCTURE CHARACTERISTICS:

- Mean Pore Size
- Pore Size Distribution
- Bubble Point (Largest Pore)
- Gas Permeability

Airborne particulate size comparison

Influenza Virus
0.08-0.12 µm
(micrometers)

Coronavirus
0.1 µm
(micrometers)

Human Hair
100 µm
(micrometers)

SARS Virus
0.08-0.09 µm
(micrometers)

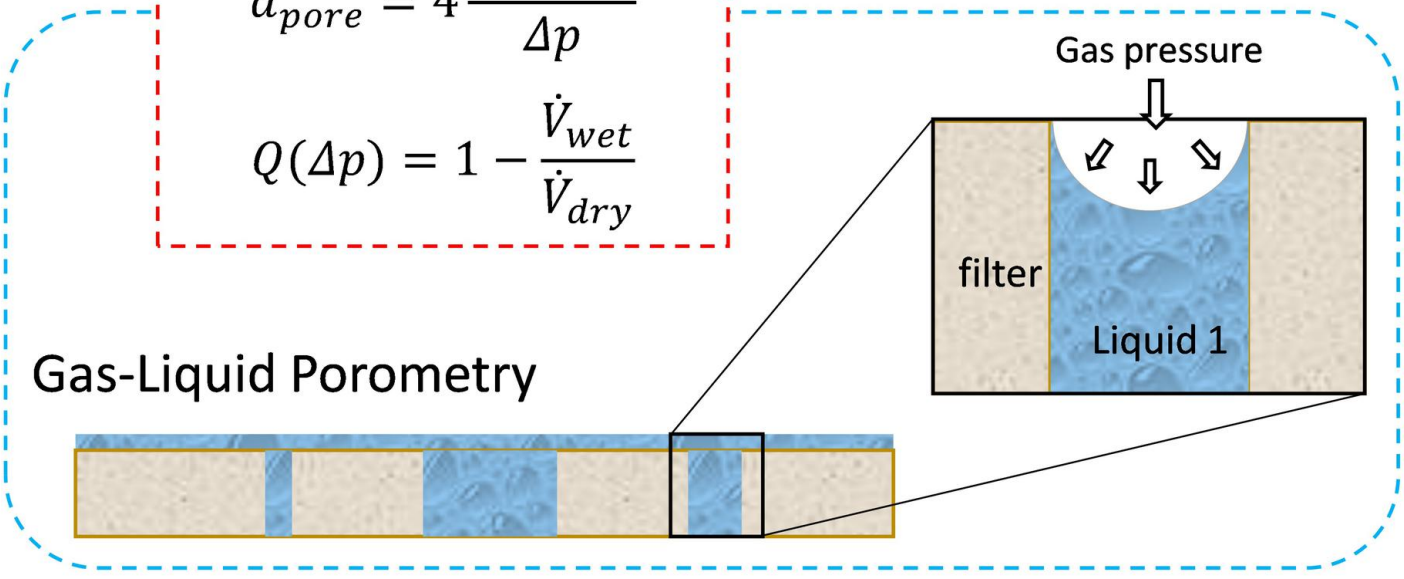
CHARACTERIZATION TECHNIQUE

Gas-Liquid Porometry

A non-toxic liquid is allowed to spontaneously fill the pores in the sample and a non-reacting gas is allowed to displace the liquid from pores by increasing the gas pressure. First the larger pores will get emptied, as the pressure increases more and more smaller pores are progressively emptied. The pressure and flow rate of gas through the emptied pores provides the through pore distribution and the first detectable flow pressure defines the so called bubble point, which is related to the maximum pore size in a sample.

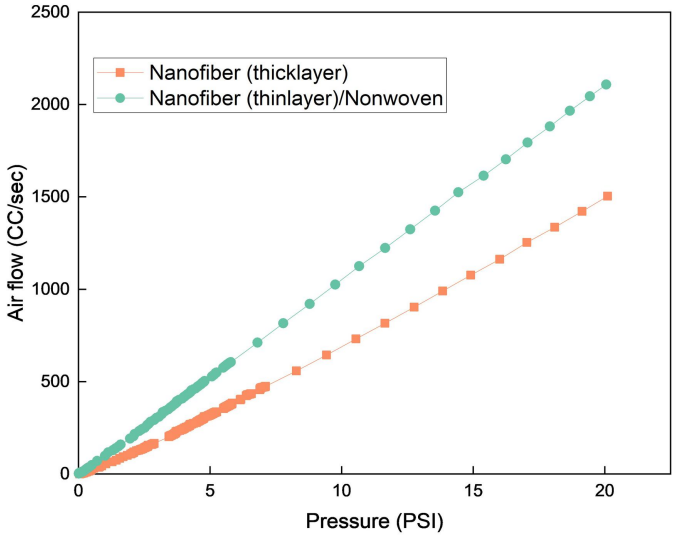
$$d_{pore} = 4\frac{\gamma\cos(\theta)}{\Delta p}$$

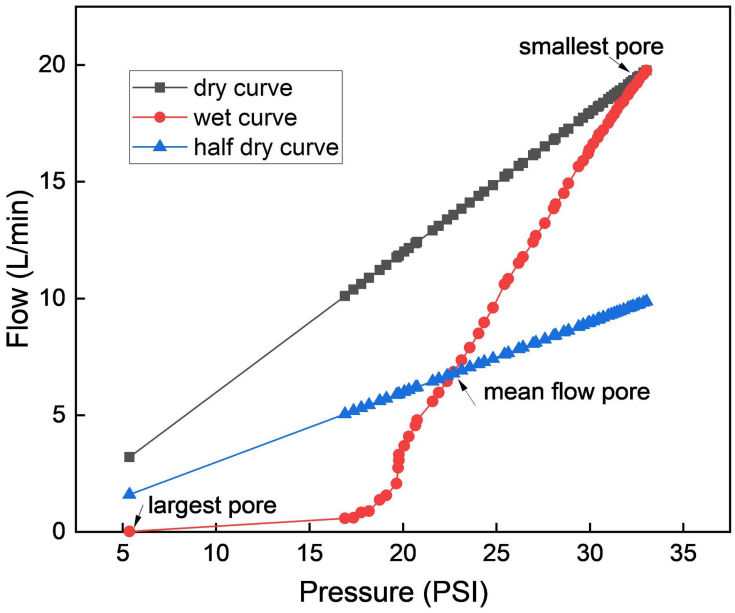
$$Q(\Delta p) = 1 - \frac{\dot{V}_{wet}}{\dot{V}_{dry}}$$



schematic of basic principle of Capillary Flow Porometry

The air permeability of two Nano filters that made with Nanofiber which tested by Capillary Flow Porometry (Nanofiber filter made by R&D of PMI)





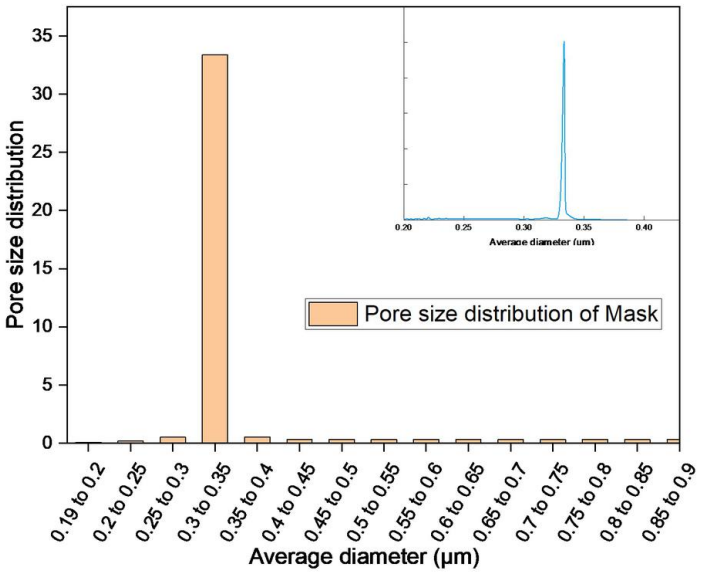
Flow Porometry Curve:

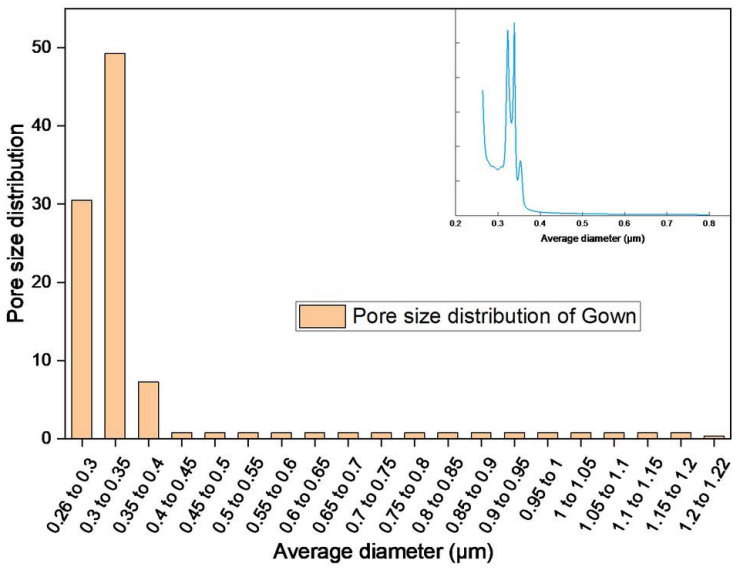
The wet and dry curves are generated using wet and dry samples. The half-dry curve is computed from the dry curve to yield half of the flow rate through the sample at a given differential pressure.

The pressure at which flow is initiated yields the largest through pore throat diameter, The pressure at which wet and half-dry curves intersect gives the mean flow pore diameter, and the smallest pore detectable is obtained from the pressure at which wet curve meets the dry curve.

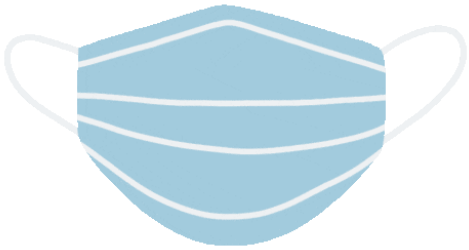
$$d_{pore} = 4\frac{\gamma\cos(\theta)}{\Delta p}$$

$$Q(\Delta p) = 1 - \frac{\dot{V}_{wet}}{\dot{V}_{dry}}$$





The pore size distribution of mask and gown has tested by PMI



PMI Capillary Flow Porometer is nowadays a very good instrument which is used for the measurement of the Pore size and also the Gas Permeability which is used in all the types of Filtration industries and Pharma industry and also for the testing of Masks and Gowns which is of utmost important nowadays.

PMI
Porous Materials, Inc.

Please contact PMI for instrument sales, leasing, testing services or a free technical consultation.

LEARN MORE

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