

Gas Absorption & Permeation Analyzer

for NBC Protective Gear

Description

The unique analyzer can determine the absorption and transport of various gases through a sheet-like material under a wide range of dynamic conditions, which in turn, can be used to simulate real-world applications. The instrument is equipped with sensitive sensors to detect small concentrations. The instrument is ideal for small and even delicate sheet-like materials such as fabrics or films.



Operation

The flow rates of two streams of nitrogen gas are independently controlled using two flow controllers. One of the gas streams is saturated by passing through bubblers containing carbon tetrachloride. The two streams mix, and a sample of the gas mixture is analyzed. The mixed gas passes through the sample from the top chamber to the bottom chamber. The gas exiting from the bottom chamber is analyzed. The gas then passes through a flow meter.

Flow can be controlled within 1-5 L/min. By controlling the amount of saturated gas that mixes with the N₂ stream through a feedback loop, it is possible to control the CCL₄ contained in the gas stream between 0.1-10 mg/L. Two 3-way valves provided in the gas line permit the operator to bypass the sample chamber in order to achieve the correct concentration of CCL₄ in the N₂ stream.

Principle

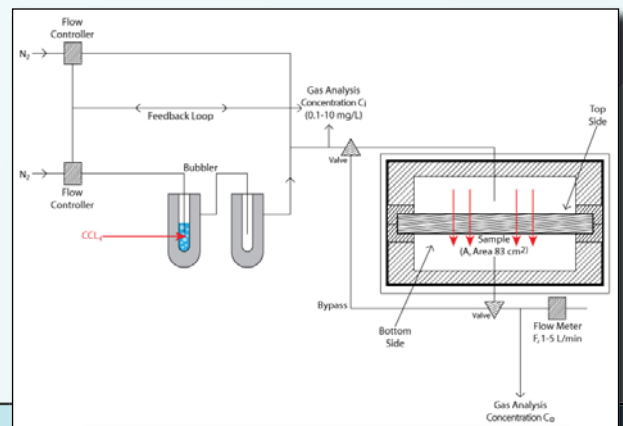
The basic principle is that when a gas stream containing a particular vapor species flows through the sample, the vapor is absorbed by the sample. Any unabsorbed vapor escapes through the outgoing gas. A sensor measures the concentration of the gas species at the inlet and outlet sides of the sample chamber. Using the measured concentration difference between the inlet and outlet, the mass absorption quantity can be calculated.

- (i) Cumulative absorption at breakthrough time, t_0 :

$$\left[\int_0^{t_0} FC_i dt - \int_0^{t_0} FC_o dt \right] / A$$

F = flow rate C_i = inlet concentration t = time
 A = area C_o = outlet concentration

- (ii) At time ' t_0 ' output concentration $C_o > 0$, and an alarm sounds.



Typical Sample Chamber Layout

Features

Versatile & User-Friendly software for:

- Fully Automated Tests
- Manual Control of all System Components
- Data Collection, Storage, Analysis, & Reporting
- Customized Testing Parameters

Applicable for Wide variety of Sheet-like materials

High Measurement speed, stability, & resolution

Flow Ability to create a wide range of testing conditions, including of gas flow

Interchangeability of System Components

Durable Stainless Steel Construction

Special Features

- Can detect change of concentration in the gas as a function of time

Specifications

Gas Concentration Measurement:

- Detectable Concentration Range: 100 - 1000 ppm
- Concentration Resolution: 1 ppm

Volumetric Flow Rate Measurement:

- Maximum Total Flow Rate: 5 L/min (+/- 1% accuracy)
- Test Concentration: 0.1-10 mg/L

Sample Area:

- 83 cm²

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Nanopore Flow Porometer
QC Porometer
Diffusion Permeameter
Gas Permeameter
Gas Diffusion Analyzer
Liquid Permeameter
Vapor Permeameter
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