

## ■ Calibration gas generation methods

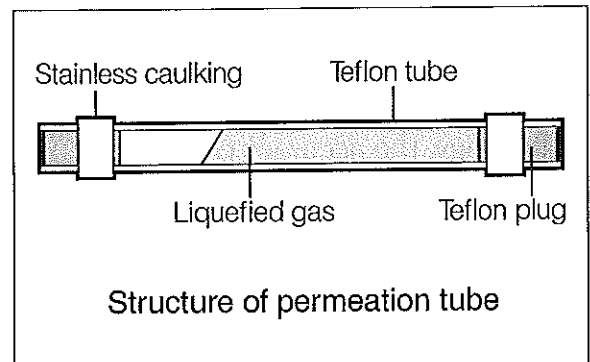
Gastec employs a variety of methods for generating calibration gases, considering the physical and chemical properties as well as the concentrations of the gases to be generated. Most typical methods are:

- Permeation tube method
- Diffusion tube method
- Dynamic gas dilution method
- Static gas dilution method
- High pressure gas cylinder method

Gastec's advanced technology has been fully utilized to minimize the concentration fluctuation caused by the gas adsorption into the walls of the calibration gas container, and to increase the accuracy of the concentration determination. With the Gastec Permeaters, either the permeation tube method or the diffusion tube method can be used.

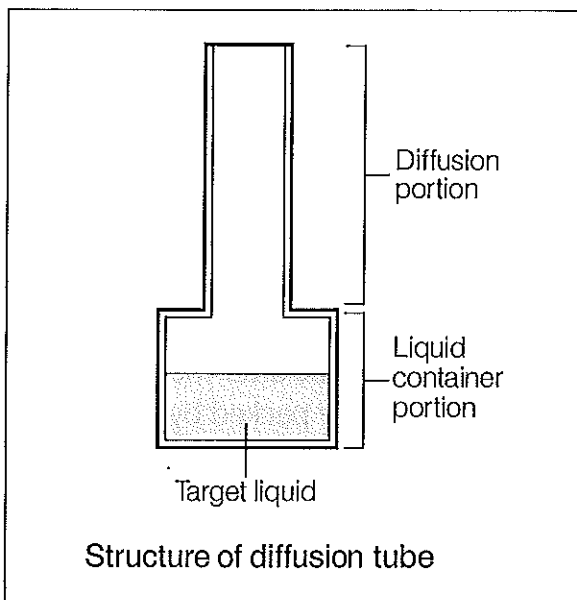
## ● Permeation tube method

A permeation tube is a sealed plastic tube with a uniform inner diameter filled with a highly pure liquefied target gas that has a boiling point of  $-70$  to  $40^{\circ}\text{C}$  ( $-94$  to  $104^{\circ}\text{F}$ ) and is of high stability. If the permeation tube is kept at a constant temperature, the liquefied gas is permeated from the tube at a constant rate. By continuously diluting this gas with a specific amount of air or nitrogen gas, a specific concentration of the target gas is continuously generated. Therefore, by adjusting the amount of dilution gas, you can dynamically generate a desired concentration of the target gas.



- **Diffusion tube method**

A diffusion tube is a glass tube that consists of a liquid container portion and a diffusion portion with a uniform inner diameter. A pure target liquid is put into the liquid container by using a glass syringe. The liquid must have a vapour pressure of 5 to 400 mm Hg at 25 to 50 °C (77 to 122 °F) and be of high stability. If this tube is kept in a constant temperature, the liquid is evaporated and diffused at a constant rate. By continuously diluting this gas with a specific amount of air or nitrogen gas, a specific concentration of the target gas is continuously generated. Therefore, by adjusting the amount of diluting gas, you can dynamically generate a desired concentration of the target gas.



- **Dynamic dilution method**

With this method, the flow rate of the target gas of precisely determined concentration and that of its dilution gas are controlled to continuously generate a desired concentration of the target gas.

- **Static dilution method**

With this method, a prescribed amount of highly purified gas or liquid of the target substance is placed in a glass container with the capacity of 20 litres or more, and is diluted with air or nitrogen gas to generate a desired concentration of the target gas.

- **High pressure gas cylinder method**

Calibration gases are supplied in high pressure gas cylinders, which have been prepared in accordance with Japanese Industrial Standard JIS K0001 to K0007. Target gases are available in a variety of concentrations that are certified by the supplier.