Permeability of membrane for SPE dehumidifier

When gas densities of two spaces separated by a solid polymer electrolyte (SPE) membrane are different with each other, the gas transmits through the membrane from higher-density space to lower-density space. Gas transmission rate (GTR) through the membrane is generally expressed as follows.

$$GTR = \frac{1}{S}\frac{dQ}{dt} = \frac{dq}{dt} = \frac{P_{pmt}}{L}(p_1 - p_2) \qquad (1)$$

Here,

GTR	: gas transmission rate through membrane	[cm³(STP)/(s cm²)]
Q	: gas transmission rate through SPE membrane with area S	
S	: area of SPE dehumidifier	[cm²]
q	: gas volume transmitted through a unit area of SPE membrane	[cm³(STP)/cm²]
t	: time	[s]
L	: membrane thickness	[cm]
p_1, p_2	: gas pressures of space 1 and 2	[cmHg]
P_{pmt}	: permeability of the gas	[cm³(STP) cm /(s cm² cmHg)]

(STP) means the volume of gas at 273K and 1 atm.

Fig. 1 is a diagram to explain Eq.(1).

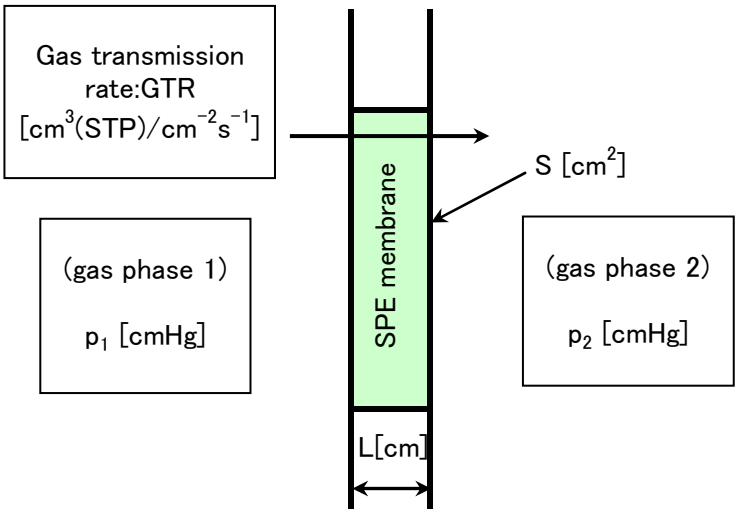

Fig.1, permeability of gas through SPE membrane

Fig.2 shows the permeability of the membrane of SPE dehumidifier to various gases. The membrane has higher permeability to water vapor than to the other gases shown in the figure.

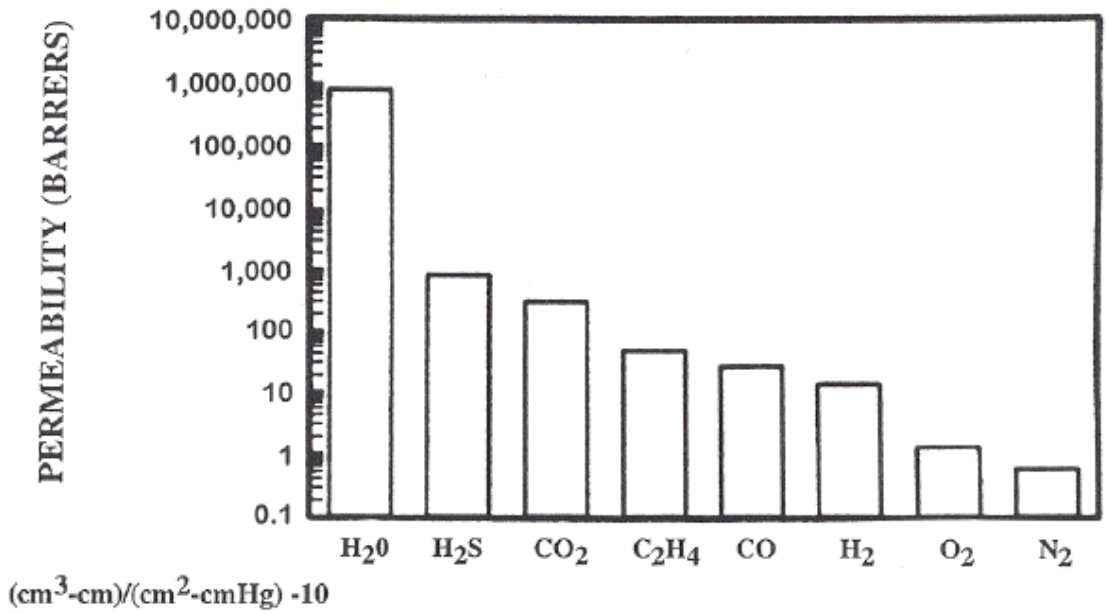

Fig.2, Permeability of SPE membrane used for SPE dehumidifier to various gases. (The unit of Barrer：1.0 Barrer =1×10^{-10}[cm^3(STP) cm/(s cm^2 cmHg)])