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On the Permeability of Silicone Rubber to Acetylene

F. D. Wall^a; E. K. Lee^a; A. G. Williamson^a

^a DEPARTMENT OF CHEMICAL ENGINEERING, UNIVERSITY OF CANTERBURY, CHRISTCHURCH, NEW ZEALAND

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NOTE

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F. D. WALL, E. K. LEE, and A. G. WILLIAMSON

DEPARTMENT OF CHEMICAL ENGINEERING
UNIVERSITY OF CANTERBURY
CHRISTCHURCH, NEW ZEALAND

Abstract

Very high rates have been reported for the permeation of acetylene through silicone rubber. Measurements in this laboratory, while consistent with the reported data for the permeation of other gases through silicone rubber, do not confirm the rates reported for acetylene.

Permeation rates of acetylene through silicone rubber were measured with the simple apparatus shown in Fig. 1. The circular membrane (~ 2.5 in. diameter) was supported mechanically by a sintered stainless steel disk, and the steady-state gas flow rates were measured with a soap bubble flowmeter. Permeation rates were measured with ambient downstream pressure, and the pressure differentials across the membrane were from 10 to 60 psig for all gases except acetylene for which the maximum pressure difference used was 24 psig. The thickness of the membrane used in the calculations was that quoted by the suppliers. Permeability constants were substantially constant for pressure differences across the membrane greater than 20 psig. The membrane used was 0.003 in. unfilled silicone rubber film obtained from Sandev Ltd., Essex, England.

The permeability constants are shown in Table 1 along with values taken from Robb (1). As can be seen, there is good agreement between the results from different studies except for acetylene for which our figure is only

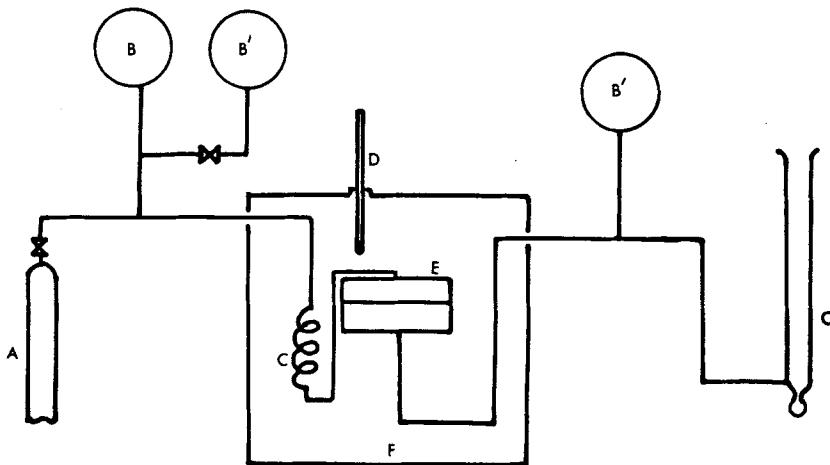


FIG. 1. *A*, gas supply cylinder; *B*, high pressure gauge, *B'*, low pressure gauge; *C*, equilibrating coil; *D*, thermometer; *E*, permeation cell; *F*, air thermostat; and *G*, soap bubble meter.

TABLE I

Permeation Constants P , $\left[\frac{\text{cm}^3(\text{STP}) \cdot \text{cm}}{\text{cm}^2 \cdot \text{cm Hg} \cdot \text{sec}} \right] \times 10^9$

Substance	20°C	25°C (I)	40°C	60°C
CO ₂	326	325	309	295
CH ₄	95	95	109	123
C ₂ H ₆	271	250	270	268
C ₂ H ₂	310	2640	296	

about 11% of that quoted by Robb (1). We believe that this difference is real and probably represents a misprint in the original report.

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REFERENCE

1. W. C. Robb, *Ann. N. Y. Acad. Sci.*, 146, 119 (1968).

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