Technical Comments

Comment on "Viscosity of Air"

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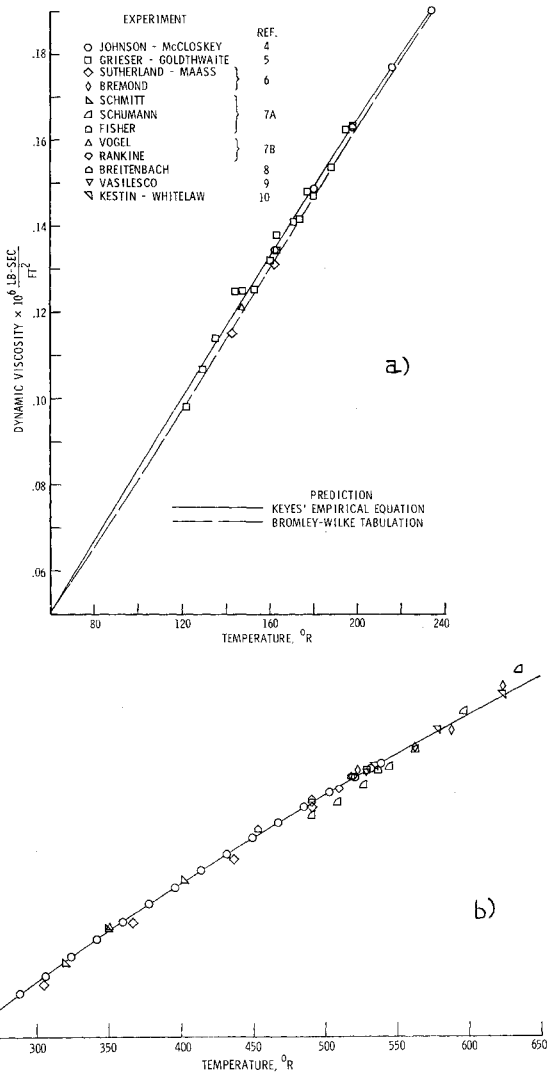
TWO points are to be made here with regard to Fiore's note.[1] One is that there are no " . . . experimental data . . . of Bromley-Wilke,"[1] and the other is that there exists a single equation to fit the viscosity of air from the lowest to the highest temperature to which data have so far been obtained. The Bromley-Wilke results are charts " . . . for prediction of the effect of temperature at low pressures based on the refined kinetic theory of Chapman and Cowling as developed by Hircshfelder, Bird, and Spotz."[2] The equation, proposed by Keyes,[3] fits the Bromley-Wilke charts in the low to moderate temperature range, and fits available experimental data at the highest temperatures better than do the Bromley-Wilke values.



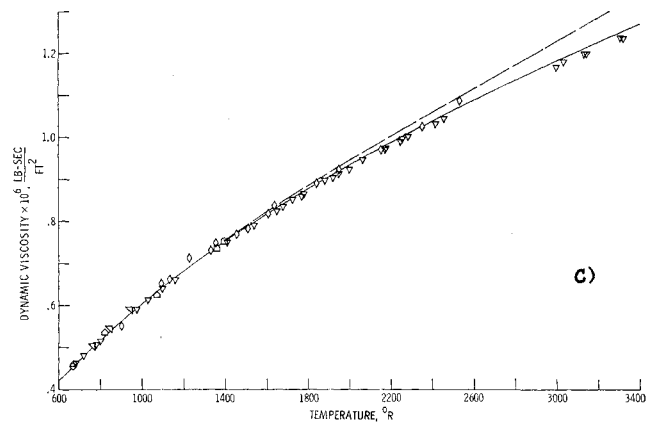


Fig. 1 Viscosity of dry air at low pressure.

Keyes equation is

$$\mu = a_0 T^{1/2} \Big/ \left(1 + \frac{a}{T}\, 10^{-(a_1/T)}\right)$$

in which for air $a_0 = 0.0232 \times 10^{-6}$ lb-sec/ft^2, $a = 220°R$, and $a_1 = 9°$R. A comparison of Keyes equation with experiment[4–10] and the Bromley-Wilke formulation is shown in Fig. 1. The good agreement is evident. Keyes equation is approximated by the linear fit $\mu = 0.000832 \times 10^{-6}\, T$ within 1% in the range $50°\text{R} < T < 200°\text{R}$.

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