THERMAL CONDUCTIVITY OF DENSE GAS MIXTURES

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The secondary high pressure thermal conductivity cell of Comings and Kramer was modified to improve the reproducibility of the measurements and to decrease the time required to make the measurements. Using carbon dioxide at pressures from 1 to 3000 atm. to calibrate the cell, the thermal conductivity of the pure gases nitrogen and ethane and approximately 20, 40, 60, and 80 % binary mixtures of carbon dioxide-nitrogen and carbon dioxide-ethane were determined at 75° C to 3000 atm. Using argon from 1 to 2500 atm. to calibrate the cell, the thermal conductivity of ethane and approximately 20, 40, 60, and 80 % mixtures of ethane and nitrogen were determined up to 1000 atm. at 75° C. Higher pressures are not being reported in this case because the conductivities are out of the range of the conductivity of the calibrating gas.

An attempt was made to use the Enskog dense gas mixture equation with a correction for internal degrees of freedom using data obtained from pure gases. However, the equation predicted mixture conductivities in error by as much as 75 % at the highest densities. Strong deviations from linearity near the critical density were explained in terms of cluster theory. The Lindsay-Bromley relation, wich was derived for dilute gases

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