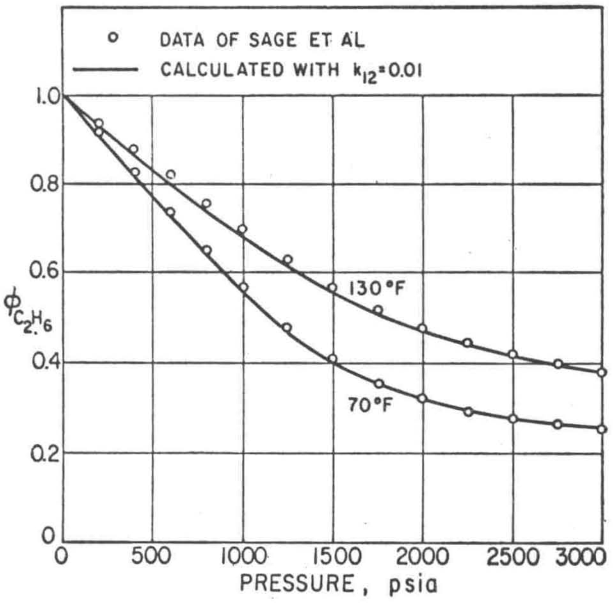

Figure 3. Fugacity coefficients of ethane in an equimolar mixture with methane

k_{12} = 0.01 obtained from second virial coefficient data

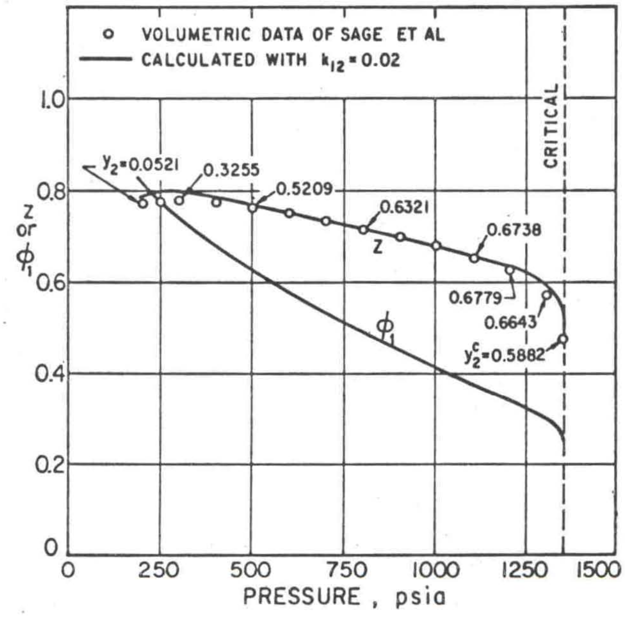

Figure 4. Compressibility factors and fugacity coefficients for saturated vapor of propane (1)–methane (2) system at 100° F.

k_{12} = 0.02 obtained from saturated liquid volume data

concentration are extremely small. These results indicate very large deviations from ideal-gas behavior and from the Lewis fugacity rule; they point to the need for serious consideration of vapor-phase imperfections in high-pressure vapor-liquid equilibria.

Quantum Gases

The configurational properties of low-molecular-weight gases (hydrogen, helium, neon) are described by quantum, rather than classical, statistical mechanics. As a result, the properties of these gases cannot be given by the same corresponding-states treatment (Equations 9, and 11 to 16) as that

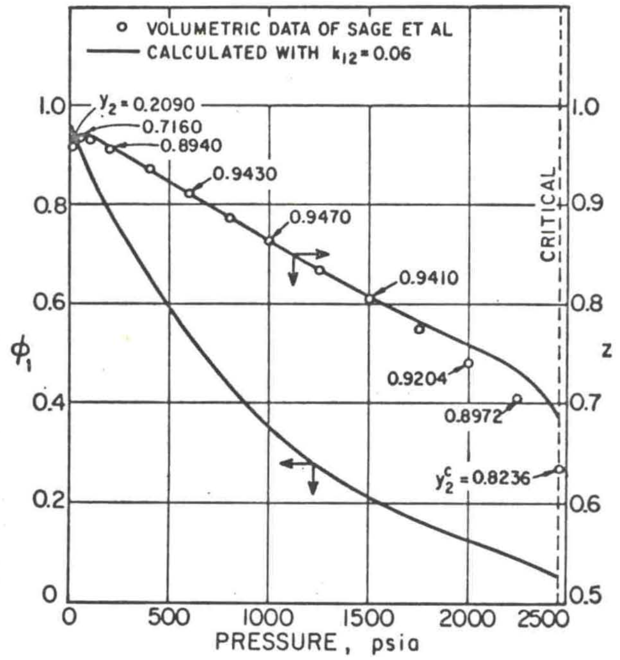

Figure 5. Compressibility factors and fugacity coefficients for saturated vapor of *n*-pentane (1)–methane (2) system at 100° F.

k_{12} = 0.06 obtained from saturated liquid volume data

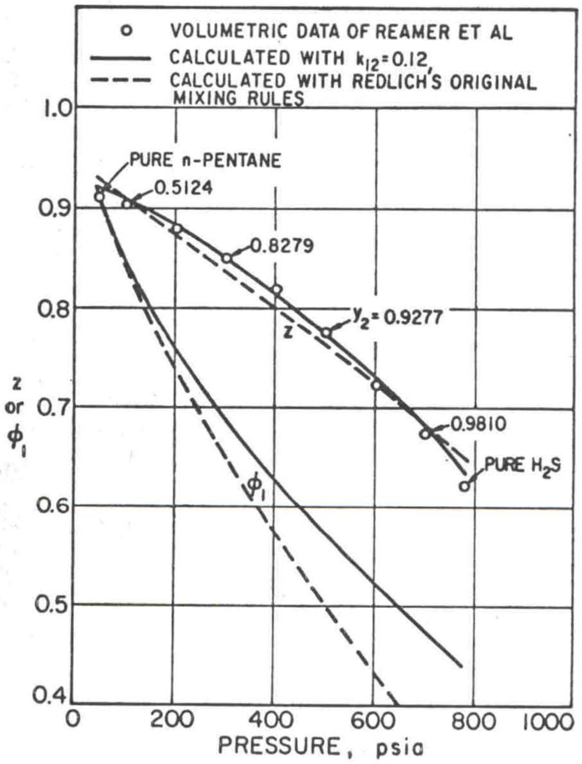

Figure 6. Compressibility factors and fugacity coefficients for saturated vapor of *n*-pentane (1)–hydrogen sulfide (2) at 160° F.

k_{12} = 0.12 obtained from second virial coefficient data

used for classical gases when the true critical constants are used as the reducing parameters. It is possible, however, to define temperature-dependent, effective critical constants (Gunn *et al.*, 1966) with which the properties of quantum gases can be made to coincide with those for classical gases. These effective