

For gas mixtures at moderate to high pressure or at low temperature the ideal-gas law does not hold because the volume of the constituent molecules and their intermolecular forces strongly affect the volumetric behavior of the gas. Comparison of experimental data for real gases with the behavior predicted by the ideal-gas law shows significant deviations. The deviation from ideal behavior can be expressed as a factor, Z , defined as the ratio of the actual volume of one mole of a real-gas mixture to the volume of one mole of an ideal gas,

$$Z = \frac{\text{volume of 1 mole of real gas at } p \text{ and } T}{\text{volume of 1 mole of ideal gas at } p \text{ and } T}, \dots\dots\dots (3.29)$$

where Z is a dimensionless quantity. Terms used for Z include deviation factor, compressibility factor, and Z factor. Z factor is used in this monograph, as will the SPE reserve symbol Z (instead of the recommended SPE symbol z) to avoid confusion with the symbol z used for feed composition.

From Eqs. 3.22 and 3.29, we can write the real-gas law including the Z factor as

$$pV = nZRT, \dots\dots\dots (3.30)$$