Thermodynamic Quantities of Redlich-Kwong Gases in Isobaric Processes of Coexistence of Two Phases

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Z. Naturforsch. **60a,** 783 – 788 (2005); received September 12, 2005

The coexistence of gaseous and liquid phases in an isobaric process are investigated by applying the thermodynamic functions of the Redlich-Kwong equation. The boiling temperatures and the enthalpy changes of vaporization of 45 substances are obtained by numerical calculations. The results agree with the experimental data within a few percent for the 45 considered substances. Some thermodynamic quantities for C_3H_6 at 1 atm are calculated numerically as a function of T and drawn graphically. The Gibbs free energy indicates a polygonal line; entropy, volume and enthalpy jump from the liquid to the gaseous phase at the boiling point. The heat capacity does not diverge to infinity but shows a finite jump at the boiling point. This suggests that a first-order phase transition may occur at the boiling point.

Key words: Redlich-Kwong Gas; Gibbs Free Energy; Isobaric Process;
Enthalpy Changes of Vaporization; First-order Phase Transition.