VARIATION OF DENSITY WITH COMPOSITION FOR NATURAL GAS MIXTURES IN THE SUPERCRITICAL REGION

A Thesis

by

WIDIA

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2003

Major Subject: Chemical Engineering

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Approved as to style and content by:

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James C. Holste
(Co-Chair of Committee)

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W. John Lee (Member) | Kenneth R. Hall (Head of Department)

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ABSTRACT

Variation of Density with Composition for Natural Gas Mixtures

in the Supercritical Region. (August 2003)

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Co-Chairs of Advisory Committee: Dr. James C. Holste
Dr. Kenneth R. Hall

The densities of three different natural gas mixtures (Case A, Case B, and Case C) were evaluated at pressures from 14 to 38 MPa (2000 to 5500 psia) and temperatures from 230 K to 350 K by using SonicWare® and NIST-14 software packages. The chosen pressures and temperatures were based on the phase diagrams for each composition and the probability of encountering such conditions in reservoir or pipeline environment. For each isotherm, the heaviest hydrocarbon was varied from 0 to 1 mole percent in increments of 0.001 ($\Delta x=0.001$) and the density calculated for each composition. After the densities were obtained, the partial derivatives of the densities with respect to composition, $\left(\frac{\partial \rho}{\partial x_i}\right)_{T,p}$ were calculated numerically at fixed pressure and temperature.

The results and calculations suggest that it is very difficult to obtain the desired accuracy ($\pm$ 0.1 %) in densities when using a combination of composition measurements and equation of state calculations.

DEDICATION

In the name of Allah, Most Gracious, Most Merciful

Dedicated to whom I love with all my heart:

My parents

My sisters

My Brothers

Aresbi

Aldy

Nabila

Rayhan

Angel, rest in peace in Heaven

ACKNOWLEDGMENTS

I would like to thank Dr. James C. Holste, my academic and research advisor. His advice, patience, and encouragement helped me to reach one of my big dreams. I would also like to thank Dr. Kenneth R. Hall for all his help through my entire study.

I thank Dr. W. John Lee for serving on my advisory committee. His classes (Reservoir Description and Reservoir management) helped me to understand the oil & gas petroleum business much better.

I want to thank the Committee of Overseas Scholarship Program for Graduate Studies Pertamina-PSCs (Production Sharing Contractors) Educational Consortium for their financial assistance.

At ConocoPhillips Indonesia Inc., my special thanks to Mr. Iwan D. Satyagunawan (Manager Block "B" Operations), Mr. Jeff L. Anderson, Mr. Heru Sunarto, Mr. Rudy Antono, Mr. Budi L. Satria, and Mr. Agung Djatmiko.

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CHAPTER I

INTRODUCTION

Accuracy and Precision

Accuracy and precision both are important in the application of flow measurement technologies; especially for custody transfer and royalty transfer for controlling and minimizing crude and hydrocarbon losses, and for maintaining the integrity of flow measurement systems to create satisfaction between customer and supplier. The accuracy is very important to be achieved since it will give potential annual revenue gain and saving in million of dollars. Table 1 shows the potential petroleum annual loss due to measurement error as reported by Y.F. Basrawi (1999).

Table 1. Annual Impact of 0.5% Measurement Error

Potential Petroleum Annual Loss due to 0.5% Error.				
Crude Oil	=		$8x10^6$	barrel/day
40 MBPD @ $ 15.00/BBL	=	$	600,000/day	
Liquefied Petroleum Gas	=		$600x10^6$	barrel/day
3 MBPD @ 12.00/BBL	=	$	36,000/day	
Natural Gas	=		2,700	MMSCD
13.5 MMSCFD @ 0.50/MSCF	=	$	6, 750/Day	
Potential Hydrocarbon Product Loss				
Gasoline, Diesel, and Jet Fuel	=		$600x10^6$	barrel/day
3 MBPD @ 22.00/BBL	=	$	66,000/day	
Potential Total Annual Revenue Impact	=	$	255,150,000	

This thesis follows the style and format of the *AIChE Journal*.

Table 2 shows the economic impact of using different orifice measurement standards as reported by Baldwin and Starling et al. (1997). Their study compared the result obtained using AGA Report#3, (1985) as Method 1 and AGA Report#3, (1992) as Method 2 for calculating volumetric flowrates for orifice meters.

Table 2. Economic Differences

Field	$/Mcf	Difference Mcfd	Total $/year
1	1.28	-130	60,736.00
2	2.35	300	257,325.00
3	2.8	3	3,066.00
4	2.6	181	171,769.00

Perfect accuracy never can be achieved, but inaccuracies can be minimized by improving meter design, calibration technology, operator qualifications. One to avoid significant losses is to reduce measurement error. Measurement errors can be reduced to 0.25% of instrument readings by proper application of current state of the art measurement technologies. The current international standard equations of state describe the gas density within $\pm$ 0.1% for condition between 273 K to 333 K, pressures less than 12 MPa, and for certain ranges of gas compositions.

Many variables, such as z-factor (density), pressure drop, pipe roughness, and abnormal operations, affect custody transfer calculations. The gas industry requires the most accurate equation of state possible because some physical properties such as

compressibility factor and density are very important. For example, the Z-factor is an important parameter to calculate volume of gases under given condition, to calculate the formation volume factor, and to calculate the coefficient of isothermal compressibility. The Z-factor and density are also very important for accurate volumetric flowrate measurement because the flow of the gas through a restriction is impacted by the molecular weight and the density of the fluids therefore, density errors have significant impact on orifice meter calculations. Densities can be determined directly, by measuring the density itself, or indirectly, by measuring temperature, pressure, and composition and then using an equation of state to calculate density. Equipment for direct measurement is not well suited for field operations, so most metering stations use the indirect method for obtaining densities. The composition of natural gas can vary widely depend on the reservoir from which the fluid is produced.

The objective of this thesis is to quantify the effect of compositional changes on density, especially for the heaviest hydrocarbon components of the natural gas at high pressures. This quantification serves to define the accuracy required in composition measurements to obtain the required accuracy ($\pm$ 0.1%) in densities determined using an equation of state. The impact of compositional measurement errors on the computed densities was determined by calculating the derivative of the densities with respect to composition at fixed pressure and temperature.

Natural Gas Overview

Natural gas is a combustible mixture of hydrocarbon gases that provides one of the cleanest, safest, and most useful of all energy sources. It burns cleanly and discharges lower levels of potentially dangerous byproducts into the atmosphere. Physically natural gas is colorless, and odorless (unless it contains hydrogen sulfide). Natural gas is formed primarily of alkanes (methane through butanes), carbon dioxide, hydrogen sulfide, nitrogen, and traces of helium, hydrogen, carbon monoxide, and carbonyl sulfide. The properties of the fluid is vary as a function of depth because of temperature and pressure gradient in the formation. The continual change of composition as a function of depth is known as compositional grading (Schulte, 1980). Raw natural gas may come from oil wells; (associated gas), or gas wells, and condensate wells, which only contain little or no crude oil.

Type of Gas Reservoir Fluids

There are five general types of reservoir fluids; dry gas, wet gas, gas condensate, volatile oil, and black oil. The types usually are classified by the relationship of the reservoir temperature to the critical temperature and the cricondentherm of the mixture, and by the surface condition. A reservoir fluid is classified as dry gas when the reservoir temperature is greater than cricondentherm and no liquid is formed during production from the reservoir to the surface. A wet gas also has a reservoir temperature greater than cricondentherm, but the liquid forms as the flow comes to the surface because the surface conditions are in the two-phase region. Black oil is a mixture of hydrocarbon

that has mostly heavy components, but some gas is evolved during production. Volatile oils, retrograde gases, and condensate gases all have fewer of the heavy components. These differences in composition cause the five fluids to have much different phase behavior, resulting in different behavior at surface conditions. Table 3 shows an example of raw natural gas compositions typical of the five types as adopted by Whitson and Brule (2000).

Table 3. Composition of Several Reservoir Fluids

Component	Dry Gas	Wet Gas	Gas Condensate	Volatile Oil	Black Oil
			Composition (mol%)		
CO_2	0.1	1.41	2.37	0.93	0.02
N_2	2.07	0.25	0.31	0.21	0.34
CH_4	86.12	92.46	73.19	58.77	34.62
C_2H_6	5.91	3.18	7.8	7.57	4.11
C_3H_8	3.58	1.01	3.55	4.09	1.01
i-C_4H_{10}	1.72	0.28	0.71	0.91	0.6
n-C_4H_{10}		0.24	1.45	2.09	0.49
i-C_5H_{12}	0.5	0.13	0.64	0.77	0.43
n-C_5H_{12}		0.08	0.68	1.15	0.21
C_6H_{14}		0.14	1.09	1.75	1.61
C_7H_{16}+		0.82	8.21	21.76	56.4

Energy Outlook

Natural gas is a vital component of the world's supply of energy. As reported for the International Energy Outlook 2002, world energy consumption is expected to increase by 60% from 1999 to 2020. Worldwide energy consumption is expected to grow from 382 quadrillion British Thermal Units (Btu) in 1999 to 612 quadrillion Btu in

2020. Natural gas is projected to be the fastest growing source of energy consumption. The natural gas portion of total energy consumption is expected to increase from 23 percent in 1999 to 28 percent in 2020. The growth in consumption is in response to demands that new power generation environmental benign and economically viable. World natural gas reserves have increased each year. As of January 1, 2002, proved world natural gas reserves, as reported by Oil & Gas Journal, were estimated at 5,451 trillion cubic feet.

Challenge

Exploration from conventional gas reserves has been improving rapidly due to some technological innovations in the exploration and production sector such as: three and four-dimensional seismic imaging (3-D & 4-D Seismic), measurement-while-drilling system (MWD), CO_2 sand fracturing, coiled tubing, and offshore drilling technology. With the above technologies, the industry is moving toward exploration and production at water depths of more than 15,000 feet. Because many deeper formations have been discovered and explored recently, more reservoir fluids at very high pressure or in the supercritical region are encountered. One of the challenging issues is our inability to predict the behavior of these fluids. Studies in this region are very limited in the open literature, especially on multi component from actual reservoir fluids.

CHAPTER II

LITERATURE AND EQUATION OF STATES REVIEW

Because the flowrate of natural gas must be measured accurately to provide fairness in custody transfer transaction, much research has been done to develop proper equations of state that provide sufficient accuracy. Such equation of state development requires both sophisticated theoretical treatments and accurate experimental *PVT* data.

Benedict, Webb, and Rubin (1940) developed the first equation that provided high accuracy over a wide range of temperature and pressure. Their equation, usually referred to as the BWR equation, has served as the guide for many other equations. Younglove and Ely (1987) developed a 32 term modified BWR equation of state to be used for calculating thermodynamic and transport properties of mixtures of fluids selected from any of 17 possible pure components. The emphasis of its database is to predict densities (especially for CO_2-rich mixtures). This equation is valid for fluids within the range 54 K to 1000 K and pressures from 0 MPa to 300 MPa.

Brugge, Hall, and Holste (1989) developed a new equation of state for hydrocarbon gases based on a truncated virial equation. This equation can be used for natural gases that contain nitrogen and carbon dioxide by treating hydrocarbon fraction of the mixture as a single component and using simple combining rules to calculate the cross virial coefficients without requiring additional parameters.

Starling *et al.* (1991) developed a natural gas equation of state with the accuracy to 0.02% for pure methane in a temperature range from 222 to 355K. For 84 natural gases with a range of compositions, the prediction is within 0.03% for the compressibility factor in the same temperature and pressure range. Their equation that usually refers as AGA8-91 can be used in a temperature range from 222 to 355 K at pressures up to 4350 psia. This equation, which is an extended version of the BWR equation that contains 53 terms, is a significant improvement from AGA8-85.

Magee, Haynes, and Hiza (1997) measured isochoroc (p,ρ,T) for several well characterized natural gas mixtures at temperatures from 225 K to 350 K at pressures to 35 MPa.

General Equation of State Review

The serious development of equations of state for real gases began with van der Waals in 1873. The form of his equation is:

$$\left(p + \frac{a}{V_M{}^2} \right)\left(V_M - b\right) = RT \tag{1}$$

which also may be written in cubic form as

$$V_M{}^3 - \left(b + \frac{RT}{p} \right)V_M{}^2 + \left(\frac{a}{p} \right)V_M - \frac{ab}{p} = 0 \tag{2}$$

For gas mixtures, the value of a and b is determined by using mixing rules. Clausius (1880) suggested the molecular attraction term is inversely proportional to the temperature.

$$\left[p + \frac{a}{T\left(V_M + c\right)^2} \right]\left(V_M - b\right) = RT \tag{3}$$

Berthelot (1899) removed the constant c, to simplify the mathematical manipulations required for thermodynamic calculations, producing

$$\left[p + \frac{a}{TV_M{}^2} \right]\left(V_M - b\right) = RT \tag{4}$$

Lorentz (1881) adjusted the molecular volume term to the form

$$\left[p + \frac{a}{V_M{}^2} \right]\left(V_M - \frac{bV_M}{V_M + b} \right) = RT \tag{5}$$

The van der Waals equation can be expressed in virial form as

$$pV_M = RT\left[1 + \frac{1}{V_M}\left(b - \frac{a}{RT} \right) + \frac{b^2}{V_M{}^2} + \ldots \right] \tag{6}$$

In the Beattie-Bridgeman equation, the constants *a, b,* and R in the Lorentz equation are replaced by

$$a = A_0\left(1-\frac{a}{V_M}\right)$$
$$b = B_0\left(1-\frac{b}{V_M}\right) \tag{7}$$
$$R = R(1-\frac{c}{V_M T^3})$$

yielding

$$p = \frac{RT}{{V_M}^2}\left(1-\frac{c}{V_M T^3}\right)\left[V_M + B_0\left(1-\frac{b}{V_M}\right)\right] - \frac{A_0\left(1-\frac{a}{V_M}\right)}{{V_M}^2} \tag{8}$$

Benedict, Webb and Rubin rearranged the Beattie-Bridgeman equation and added an exponential term in density to maintain accuracy closer to the critical point

$$p = \frac{RT}{V_M} + \frac{B_0 RT - A_0 - \frac{C_0}{T^2}}{{V_M}^2} + \frac{bRT-a}{{V_M}^3} + \frac{a\alpha}{{V_M}^6} + \frac{c}{T^2{V_M}^3}\left(1+\frac{\gamma}{{V_M}^2}\right)\exp\left(\frac{-\gamma}{{V_M}^2}\right) \tag{9}$$

where A_0, B_0, C_0, a, b, c, α, and γ are all constant for a given fluid.

They also used statistical mechanic to derive mixing rules for the parameters:

$$
\begin{aligned}
A_0 &= \sum_{ij} y_i y_j A_{0ij} \\
B_0 &= \sum_{ij} y_i y_j B_{0ij} \\
C_0 &= \sum_{ij} y_i y_j C_{0ij} \\
a &= \sum_{ijk} y_i y_j y_k a_{ijk} \\
b &= \sum_{ijk} y_i y_j y_k b_{ijk} \\
c &= \sum_{ijk} y_i y_j y_k c_{ijk}
\end{aligned}
\tag{10}
$$

The MBWR equation subsequently evolved into a 32 term version (Younglove and Ely, 1987) where G(1) through G(32) are numerical parameters that are determined by fitting the equation to extensive and accurate data for a reference fluid (e.g., methane or propane). Other fluids then are described by using reduced variables for temperature and density.

$$
\begin{aligned}
P = \rho RT &+ \rho^2\left[G(1)T + G(2)T^{1/2} + G(3) + \frac{G(4)}{T} + \frac{G(5)}{T^2}\right] + \rho^3\left[G(6)T + G(7) + \frac{G(8)}{T} + \frac{G(9)}{T^2}\right] \\
&+ \rho^4\left[G(10)T + G(11) + \frac{G(12)}{T}\right] + \rho^5\left[G(13)\right] + \rho^6\left[\frac{G(14)}{T} + \frac{G(15)}{T^2}\right] + \rho^7\left[\frac{G(16)}{T}\right] \\
&+ \rho^8\left[\frac{G(17)}{T} + \frac{G(18)}{T^2}\right] + \rho^9\left[\frac{G(19)}{T^2}\right] + \rho^3\left[\frac{G(20)}{T^2} + \frac{G(21)}{T^3}\right]\exp(\gamma\rho^2) \\
&+ \rho^5\left[\frac{G(22)}{T^2} + \frac{G(23)}{T^4}\right]\exp(\gamma\rho^2) + \rho^7\left[\frac{G(24)}{T^2} + \frac{G(25)}{T^3}\right]\exp(\gamma\rho^2) + \rho^9\left[\frac{G(26)}{T^2} + \frac{G(27)}{T^4}\right]\exp(\gamma\rho^2) \\
&+ \rho^{11}\left[\frac{G(28)}{T^2} + \frac{G(29)}{T^3}\right]\exp(\gamma\rho^2) + \rho^{13}\left[\frac{G(30)}{T^2} + \frac{G(31)}{T^3} + \frac{G(32)}{T^4}\right]\exp(\gamma\rho^2).
\end{aligned}
\tag{11}
$$

CHAPTER III

METHOD OF STUDY

Mixture Compositions

Table 4 shows the molar compositions of three different natural gas mixtures used for the study. The mixtures have 11 components including carbon dioxide and nitrogen. The natural gas compositions were taken from several literature sources that might represent gas mixtures from different fields.

Table 4. Molar Composition of Gas Mixtures

Component	Case A	Case B	Case C
	Composition (mol %)		
CH_4	66.59	71.02	89.23
C_2H_6	16.06	15.74	4.9
C_3H_8	9.11	7.51	1.95
i-C_4H_{10}	1.01	0.89	0.55
n-C_4H_{10}	3.31	1.94	0.65
i-C_5H_{12}	0.68	0.34	0.1
n-C_5H_{12}	1.02	0.27	0.08
C_6H_{14}	0.8	0.27	0.03
C_7H_{16}	1.07	0.03	0
N_2	0.14	0.32	0.73
CO_2	0.21	1.67	1.78
Total	100	100	100

Method

The densities of three different natural gas mixtures were evaluated at pressures from 14 to 38 MPa (± 2000 to 5500 psia) and temperatures from 230 K to 350 K. The chosen pressures and temperatures were based on the phase diagrams for each composition and the probability of encountering such conditions in reservoir or pipeline. These phase diagrams show the conditions under which the various phases of natural gas mixtures will be present.

Figure 1 shows the pressure-temperature diagram for the Case A gas mixture. A1 is the Case A gas mixture with 66.59 % methane, and 1.07 % heptane. The predicted critical pressure and temperature are 11.65 MPa and 284.11 K, respectively the cricondenbar is at 12.05 MPa and temperature 301.62 K, and the cricondentherm is at 6.05 MPa and 344.17 K. A2 is the case A gas mixture with 66.59 % methane, and 0.07 % heptane. The predicted critical pressure and temperature are 10.65 MPa and 277.60 K, the cricondenbar is at 10.91 MPa and temperature 287.51 K, and the cricondentherm is at 6.16 MPa and 321.69 K.

Figure 2 shows the pressure-temperature diagram for the Case B gas mixture. B1 is the Case B gas mixture with 71.02 % methane, and 0.03 % heptane. The critical point is at 9.46 MPa and 259.44 K, the cricondenbar is at 9.79 MPa and 272.47 K, and the cricondentherm is at pressure 5.79 MPa and temperature 297.23 K. B2 is the case B gas mixture with 70.02 % methane, and 1.03 % heptane. The predicted critical pressure and temperature are 10.55 MPa and 263.81 K, the cricondenbar is at 11.58 MPa and temperature 286.55 K, and the cricondentherm is at 5.33 MPa and 332.57 K.

Figure 3 shows the pressure temperature diagram for the Case C gas mixture. C1 is the Case C gas mixture with 89.23 % methane, and 0 % heptane. The critical point is at 6.70 MPa and 214.76 K, the cricondenbar is at 7.72 MPa, and 226.97 K, and the cricondentherm is at 4.47 MPa and 254.31 K. C2 is the Case C gas mixture with 88.23 % methane, and 1.0 % heptane. The critical point is at 9.65 MPa and 228.72 K, the cricondenbar is at 13.2 MPa, and 268.81 K, and the cricondentherm is at 4.95 MPa and 324.33 K.

These calculation and diagrams were generated using software packages (PhasePro®) from Lomic, Incorporated, that uses the Peng-Robinson equation of state for phase equilibrium calculations.

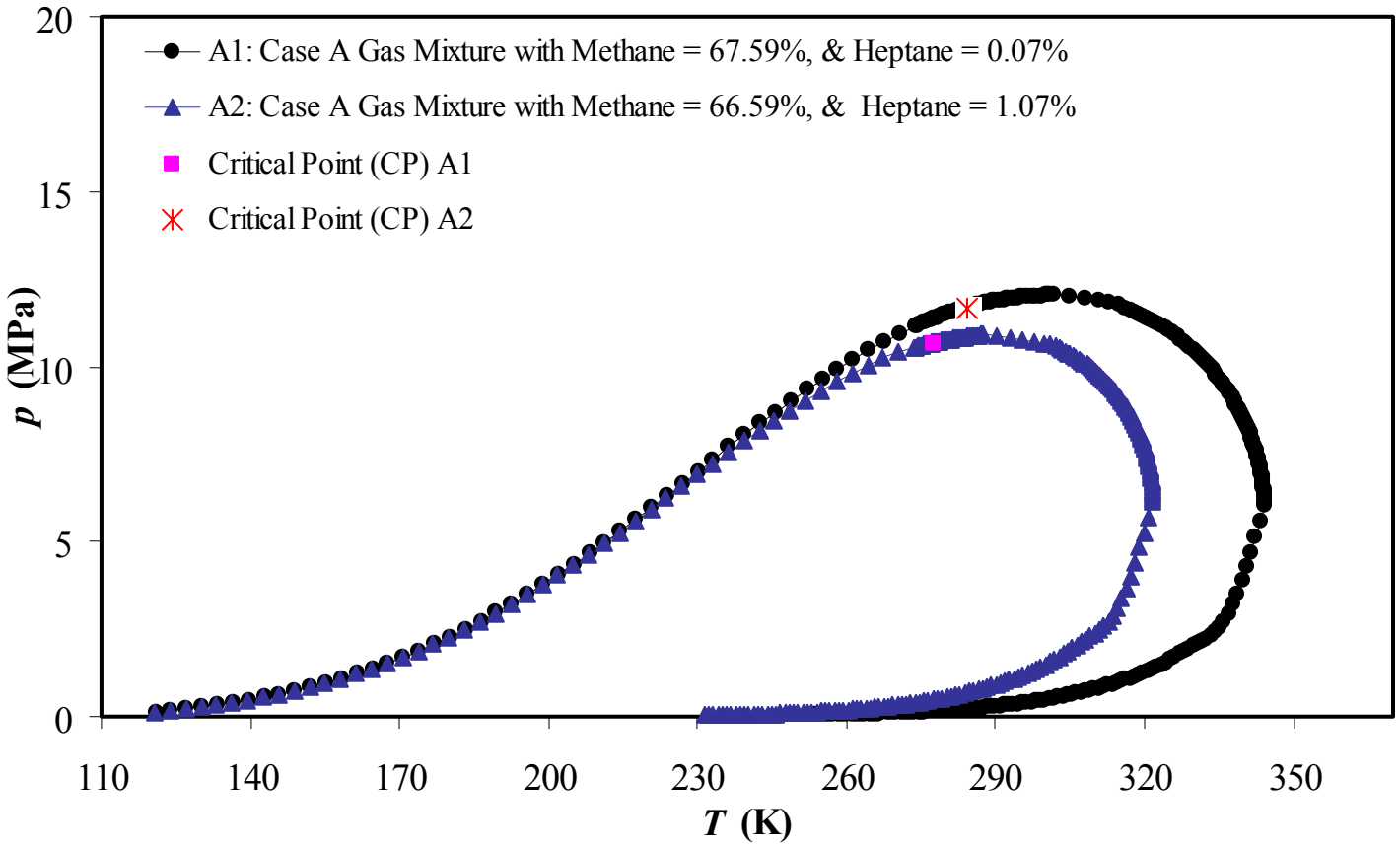

Figure 1. Vapor-Liquid Phase Diagram for Gas Mixture A

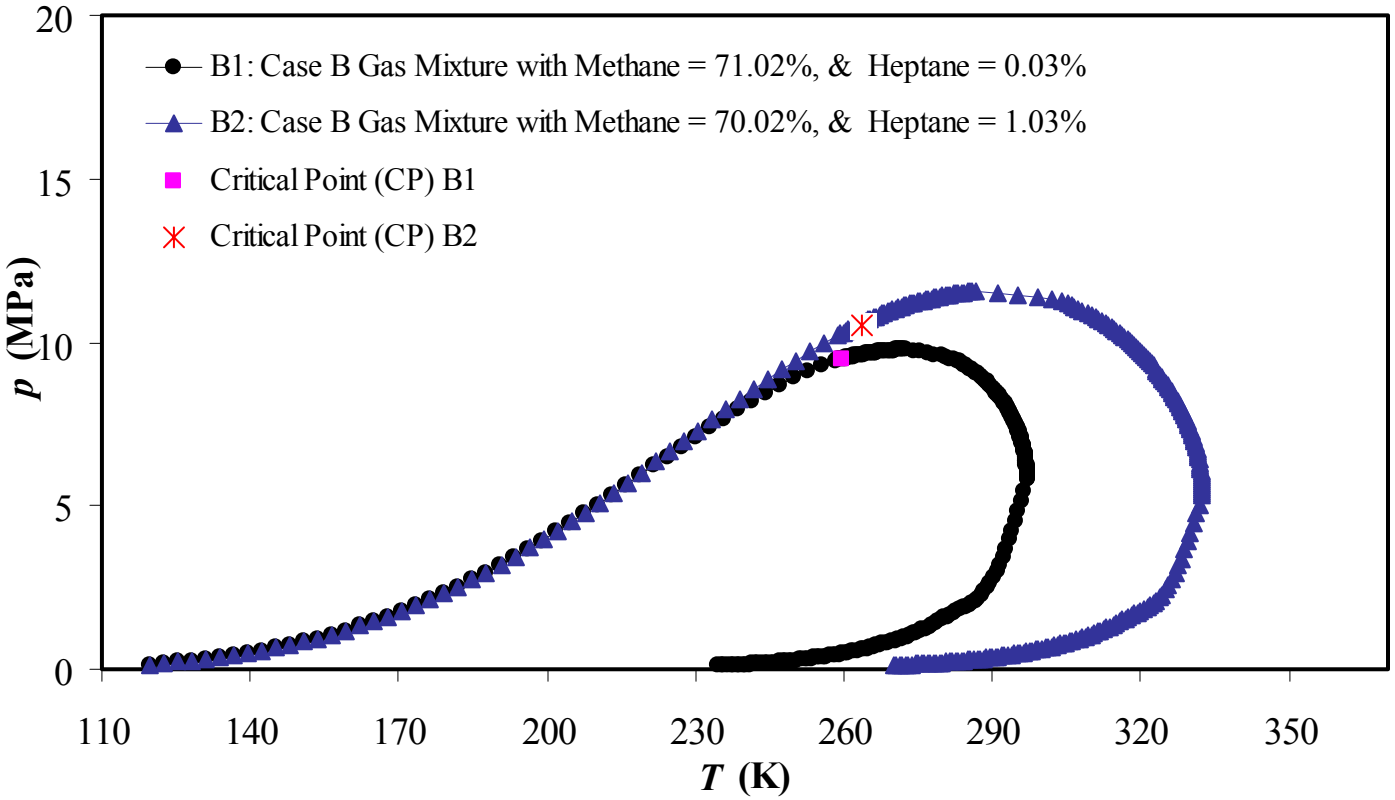

Figure 2. Vapor-Liquid Phase Diagram for Gas Mixture B

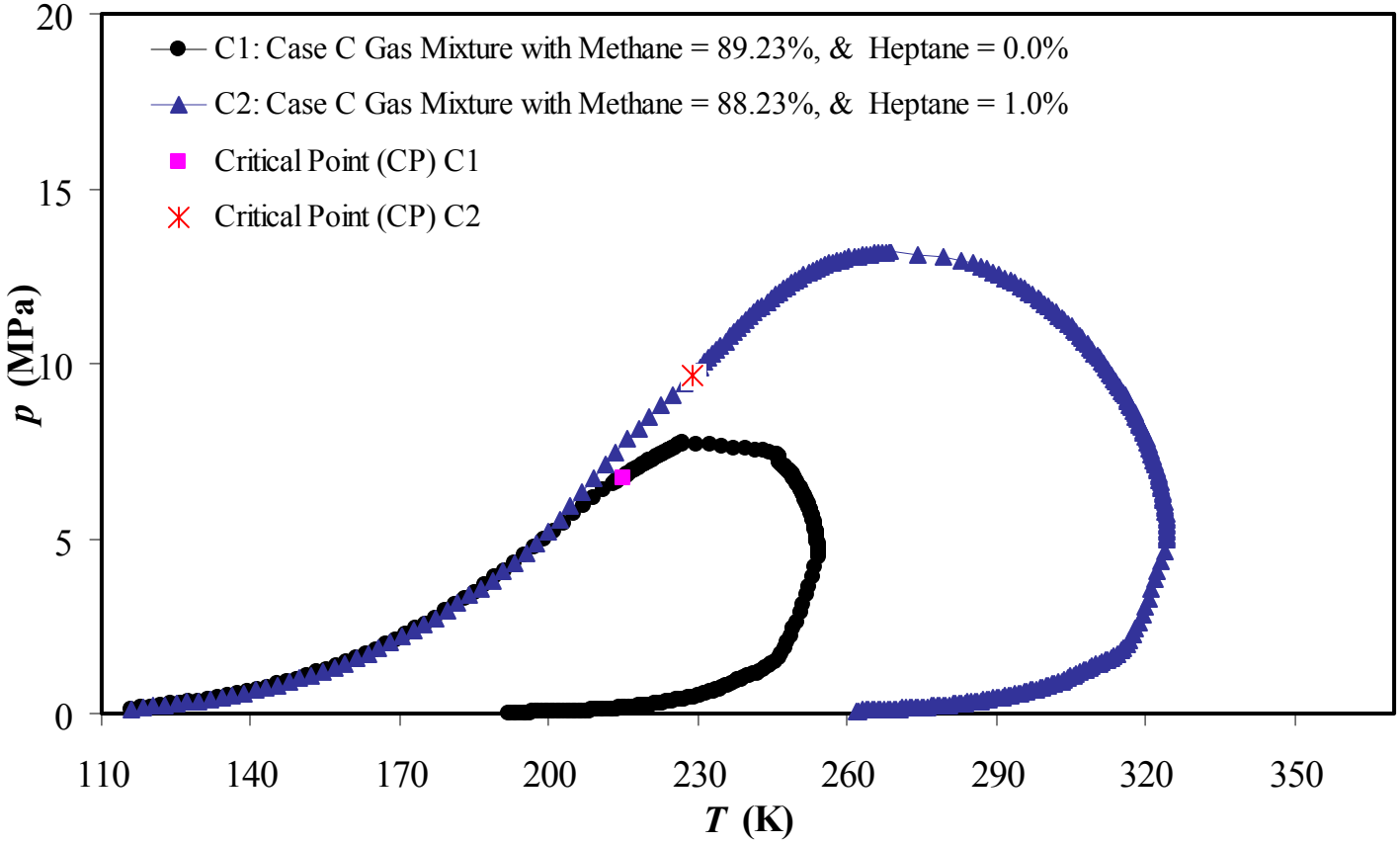

Figure 3. Vapor-Liquid Phase Diagram for Gas Mixture C

The primary focus of this study is to determine the accuracy with which composition must be known to obtain a desired level of accuracy when calculating densities using an equation of state. The partial derivative of density with respect to mole fraction at constant temperature and pressure therefore is the pertinent variable. For each isotherm, the heaviest hydrocarbon was varied from 0 to 1 mole percent in increments of 0.001 ($\Delta x=0.001$) and the density calculated for each composition. After the densities were obtained, the partial derivatives of the densities with respect to composition $\left(\frac{\partial \rho}{\partial x_i}\right)_{T,p}$ were calculated numerically at fixed pressure and temperature. At the end δx_i were tabulated for further analysis. The partial derivative is calculated from adjacent points using

$$\left(\frac{\partial \rho}{\partial x_i}\right)_{T,p} = \frac{\rho(2)-\rho(1)}{x_i(2)-x_i(1)} \tag{12}$$

The total derivative for density is,

$$d\rho = \left(\frac{\partial \rho}{\partial x_i}\right)_{T,p} dx_i + \left(\frac{\partial \rho}{\partial T}\right)_{x_i,p} dT + \left(\frac{\partial \rho}{\partial p}\right)_{T,x_i} dp + ... \tag{13}$$

The composition dependence is the focus of this study, so the first term is of primary interest. The numerically derived partial derivatives were used to calculate the error in composition that would produce an error of 0.1 % in the calculated densities. The finite differences are related to the derivatives as follows.

$$-\delta\rho = \left(\frac{d\rho}{dx_i}\right)_{T,p} \delta x_i \tag{14}$$

Solving for the error in mole fraction produces

$$-\delta x_i = \delta\rho\left(\frac{d\rho}{dx_i}\right)^{-1} \tag{15}$$

For an error in density of 0.1 %, this becomes

$$\delta x_i = \frac{10^{-3}}{\frac{1}{\rho}\left(\frac{d\rho}{dx}\right)} \tag{16}$$

For this work, normal heptane (*n*-C_7) was used as the component of interest for the calculations.

Software Packages

The software packages capable of state-of-the-art density calculations were used in this work. In addition, the phase boundaries for each composition were estimated using PhasePro® from Lomic Inc., which uses the Peng-Robinson equation of state to generate *P-T* Diagrams. Meanwhile, NIST-14 and SonicWare® were used to predict the densities.

NIST-14 (version 9.08B 1993) was developed by National Institute Standards and Technology. It is a mixture property database for calculating thermodynamic and transport properties of mixtures of fluid including any of 17 possible pure components. The emphasis of its database is to predict density (especially for CO_2-rich mixtures). This software is designed to operate within the range 54 K to 1000 K and pressure from

0 MPa to 300 MPa. It uses a 32-term modified Benedict-Webb-Rubin (MBWR32) equation of state whose functional form was originally developed for nitrogen.

The MBWR32 equation for computing pressure as a function of density and temperature has been widely used because it has the advantages both of high computational speed, and high accuracy (Younglove and Ely, 1987). It is a good choice when describing data of high accuracy that cover wide ranges of temperature and pressure.

Because of some computational difficulties observed when using NIST-14, especially for case C at temperatures in the range 330 K to 350 K, another software package (SonicWare®) also has been used to calculate the densities.

SonicWare® is a registered trademark of Lomic, Incorporated. It uses the equation of state that conforms to AGA Report No. 8 and to the International Standards Organization Document ISO 12213. This software claims to compute speed of sound, density, and Z-factor to better than 99.95% accuracy for typical natural gas found in transmission pipelines and better than 99.9% accuracy for typical production gas. The equation of state used for this software is a 53 constant extended Benedict-Webb-Rubin (BWR), which was developed by Starling *et al*. (1991). The target accuracy for this equation is: ± 0.1 % within the temperature range -8 to 62 ^{o}C at pressures to 12 MPa, ± 0.3 % within the temperature range -60 to 120 ^{o}C at pressures to 17 MPa, ± 0.5 % within the temperature range -130 to 200 ^{o}C at pressures to 70 MPa, and ± 1.0 % within the temperature range -130 to 62 ^{o}C at pressures to 140 MPa. This equation, usually is referred to as AGA8-92, gives the *PVT* properties of gas mixtures in the following

composition ranges: 0 to 100 % nitrogen, 0 to 100 % carbon dioxide, 0 to 100 % ethane, 0 to100 % methane, 0 to 12 % propane, 0 to 6 % butanes, 0 to 4 % for pentanes, and 0 to dew point hexanes plus.

This software has two recommended methods to compute highly accurate compressibility factors and densities for natural gas custody transfer and other gas measurement applications, which are Detail Characterization and Gross characterization Method. Detail Characterization Method requires the natural gas composition, i.e., the mole fractions or mole percentages of the components in the natural gas mixture. Gross Characterization Method requires the molar ideal gross heating value (H_{CH}) of the mixture of hydrocarbon components presents in the natural gas.

Because the compositions are known, the Detailed Characterization Method was chosen to predict densities for this study. This method was developed to describe the gas phase pressure-temperature-density behavior of natural gas mixtures over a wide range of conditions. This method reduces the uncertainty of compressibility factor and density calculation for natural gases that may contain mole percentages of heavier hydrocarbon greater than 1%.

The density calculation in this software has 2 different modes: Point Calculation, which does the calculation for a single pressure and temperature; and Range Calculation, which does the Calculation at various temperatures but constant pressure (isobaric), varying pressure (Isothermal), at varying pressures but constant temperature (isothermal) or with both pressure and temperature varying (Table).

In contrast to NIST-14, the AGA8 equation is valid for the gas phase only. Because SonicWare® follows the procedure specified in the AGA8 report, it has the limitations specified in the report. The AGA8-92 equation of states works (with varying degrees of accuracy) for temperatures from 143.15 K to 673.15 K (–130 ^{o}C to 400 ^{o}C) at pressures up to 280 MPa (40,000 psia).

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

The derivatives of the density with respect to composition ($d\rho/dx$) of three different natural gas mixtures were calculated numerically at fixed pressure and temperature. For each isotherm, the heaviest hydrocarbon was varied from 0 to 1 mole percent with in increments of 0.001 ($dx=0.001$). The results presented here are those calculated using SonicWare®. The results obtained using NIST 14 are presented in Appendix B.

The results are summarized as follows. Table 5, Figure 4 and Figure 5 show the average change in mole fraction that changes the mass density by 0.1% (δx_i) for gas mixture A. This value represents the error in composition measurement that would introduce an error of 0.1% into calculated densities even if the equation of state describes the *PVT* behavior perfectly. The lowest values ($\delta x_i=0.016\%$) occur at temperatures of 310 K and 330 K, at a pressure of 13.789 MPa. The phase behavior prediction for Case A, gives a critical temperature of 284.11 K when the mole fraction of methane is 66.59% and that of heptane is 1.07%. The most stringent measurement requirement occurs in the supercritical retrograde region for this gas.

Table 5. Average Change in Mole Fraction of C_7H_{14} that Changes the Density by 0.1 Percent for Gas Mixture A Using SonicWare®

T (K)	*p* (MPa)							
	13.789	17.237	20.684	24.132	27.579	31.026	34.474	37.921
	δx_i avg. (mol %)							
270	0.023	0.028	0.031	0.034	0.036	0.037	0.038	0.040
290	0.017	0.022	0.026	0.029	0.031	0.033	0.035	0.036
310	0.016	0.019	0.023	0.026	0.028	0.031	0.032	0.034
330	0.016	0.019	0.022	0.024	0.027	0.029	0.031	0.033
350	0.017	0.019	0.021	0.024	0.026	0.028	0.030	0.031

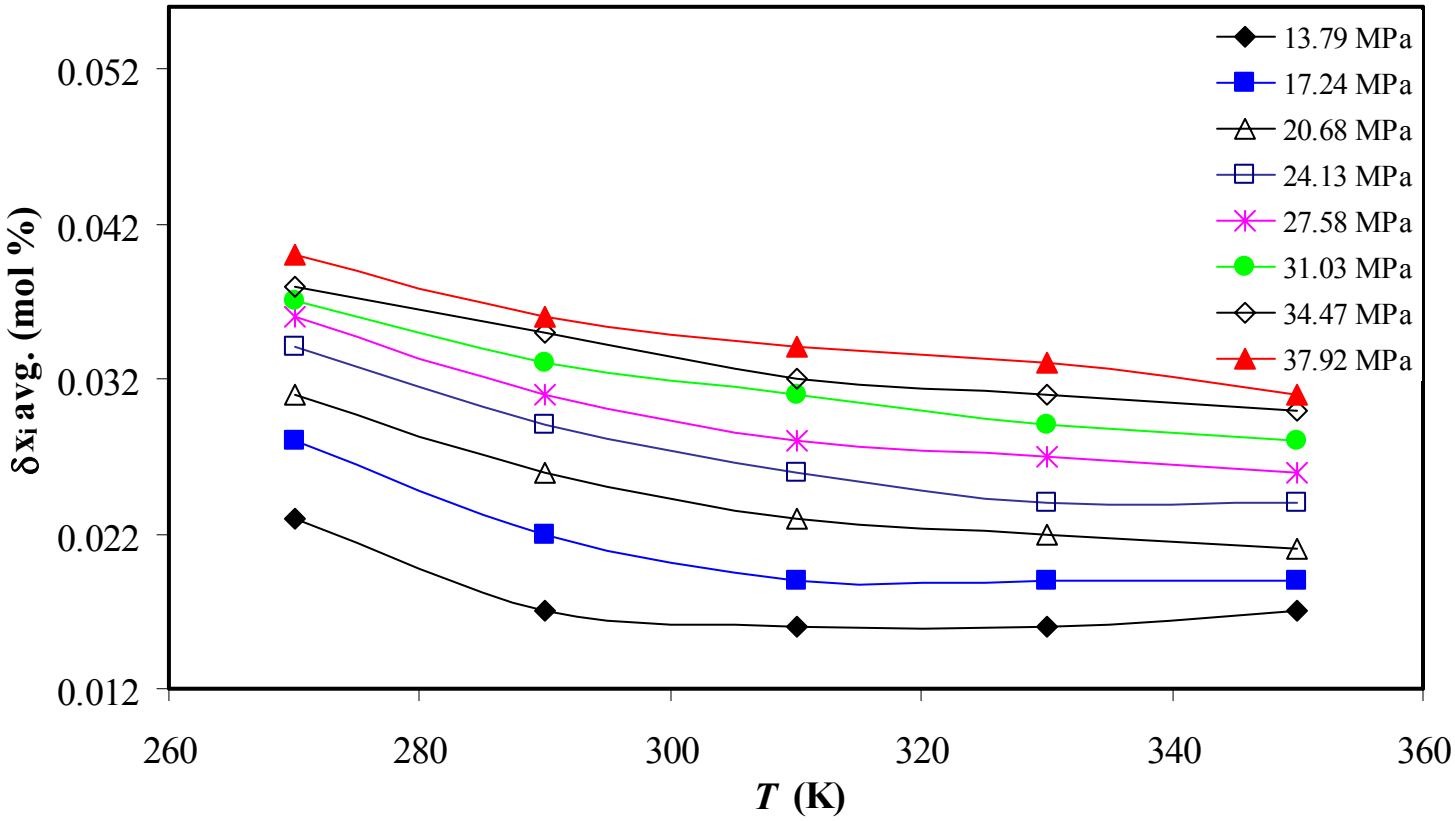

Figure 4. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture A Using SonicWare®

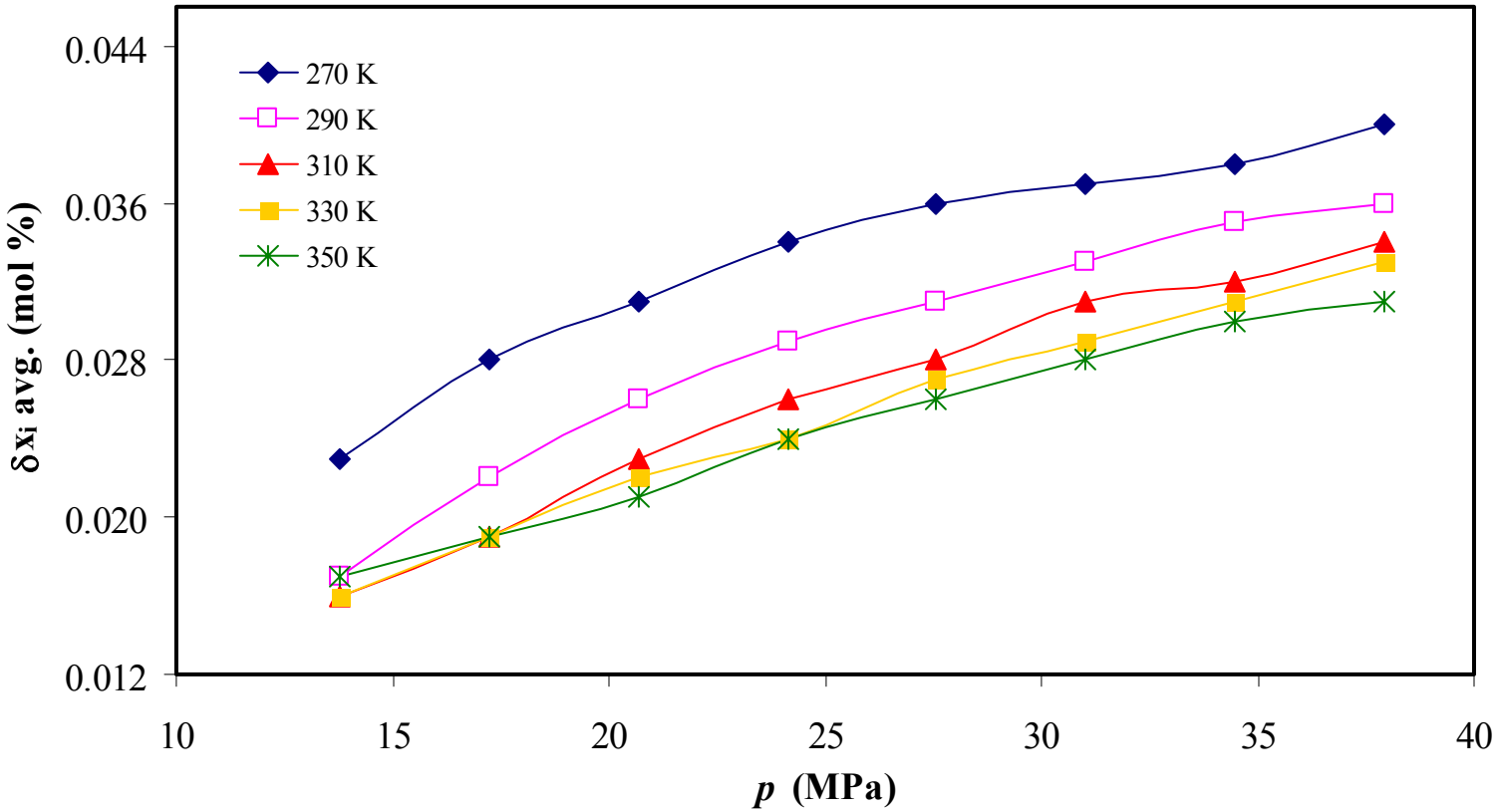

Figure 5. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Pressure for Gas Mixture A Using SonicWare®

Table 6, Figure 6, and Figure 7 show the change in mole fraction that changes the mass densities by 0.1% (δx_i) for gas mixture B. The lowest δx_i, which is 0.016 mol %, occurs at temperatures of 290 K and 310 K, at a pressure of 13.789 MPa. The phase behavior prediction for Case B, gives a critical temperature is 263.81 K when the mole fraction of methane is 70.02% and that of heptane is 1.03%. Again, the most stringent measurement requirement occurs in the supercritical retrograde region.

Table 6. Average Change in Mole Fraction of C_7H_{14} that Changes the Density by 0.1 Percent for Gas Mixture B Using SonicWare®

T (K)	*p* (MPa)							
	13.789	17.237	20.684	24.132	27.579	31.026	34.474	37.921
	δx_i avg. (mol %)							
260	0.023	0.027	0.030	0.033	0.034	0.036	0.037	0.038
270	0.020	0.024	0.027	0.030	0.032	0.033	0.035	0.036
290	0.016	0.020	0.023	0.026	0.028	0.030	0.032	0.033
310	0.016	0.018	0.021	0.024	0.026	0.028	0.030	0.031
330	0.017	0.018	0.020	0.023	0.025	0.027	0.028	0.030
350	0.018	0.019	0.020	0.022	0.024	0.026	0.027	0.029

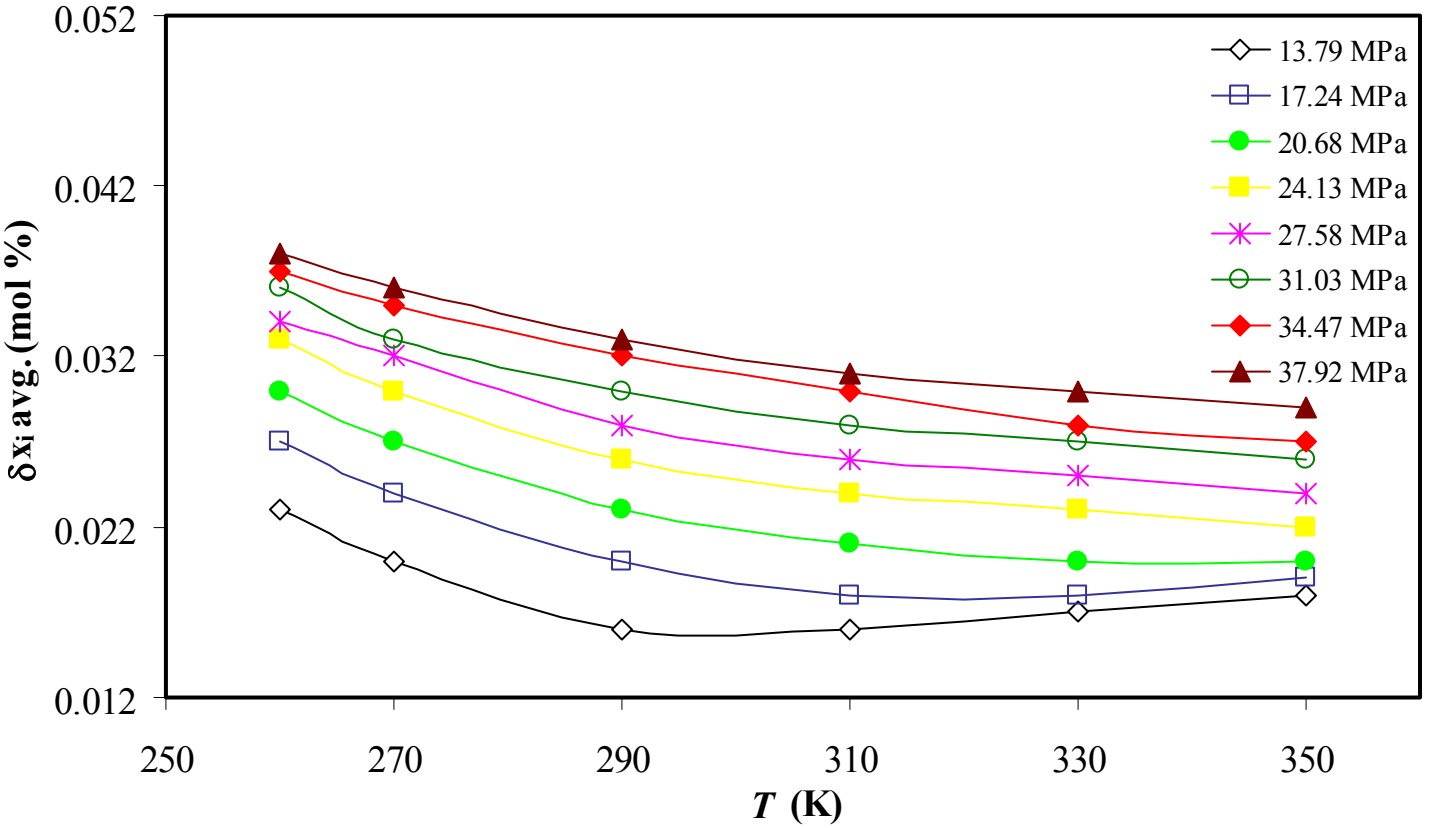

Figure 6. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture B Using SonicWare®

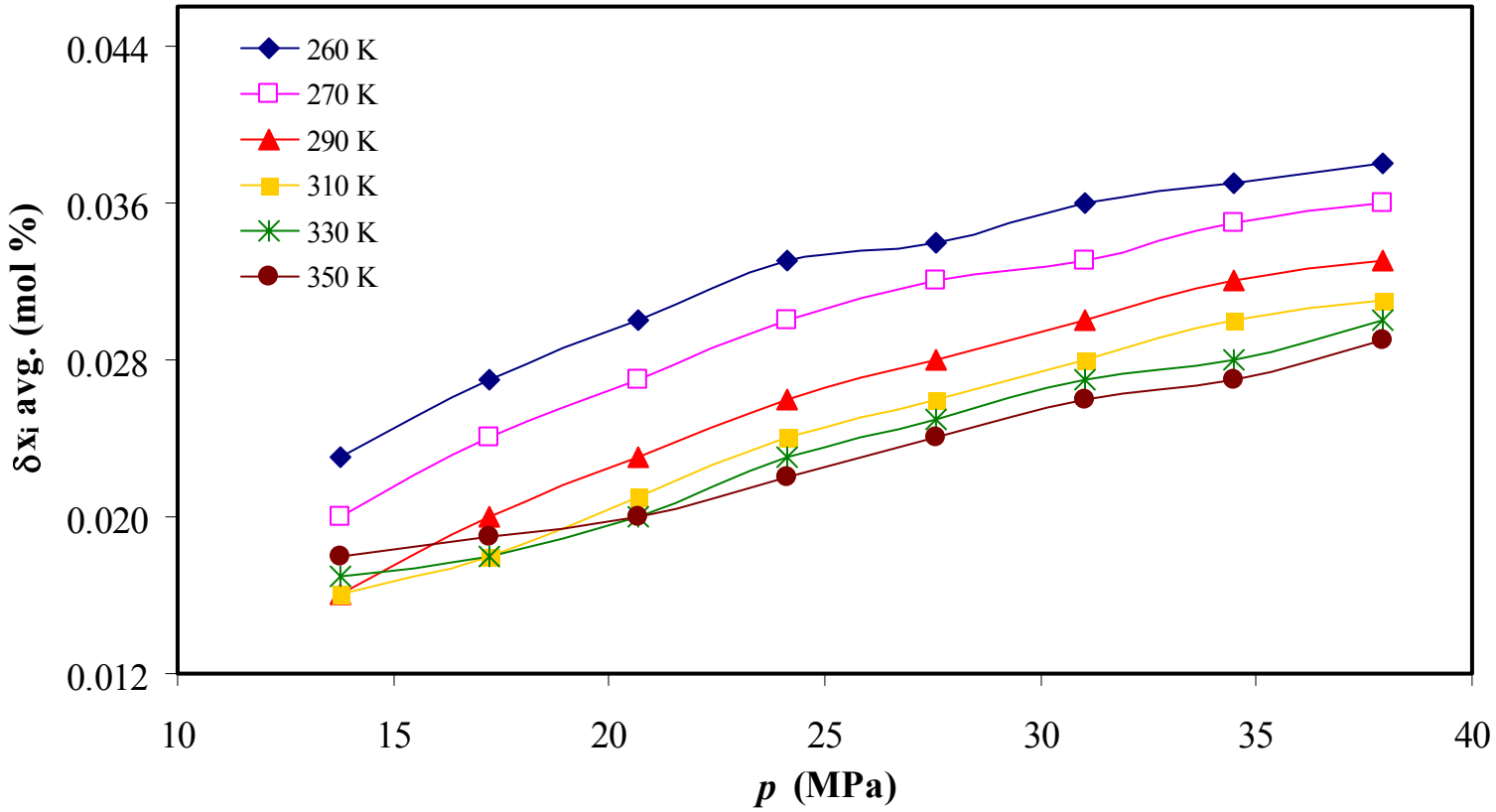

Figure 7. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Pressure for Gas Mixture B Using SonicWare®

Table 7, Figure 8, and Figure 9 show the change in mole fraction of *n*-C_7H_{14} that changes the mixture mass densities by 0.1% for gas the case C gas mixture. The values range from 0.016 to 0.38 mol %, with the minimum values occurring in the 290 to 310 K temperature range at pressures slightly above the two-phase region. The phase behavior prediction fo Case C, gives a critical temperature of 228.72 K when the mole fraction of methane is 88.23% and that of heptane is 1.0%. Again, the most stringent measurement requirements occur in the supercritical retrograde condensation region.

Table 7. Average Change in Mole Fraction of C_7H_{14} that Changes the Density by 0.1 Percent for Gas Mixture C Using SonicWare®

T (K)	*p* (MPa)							
	13.789	17.237	20.684	24.132	27.579	31.026	34.474	37.921
	δx_i avg. (mol %)							
250	0.028	0.031	0.031	0.032	0.032	0.033	0.034	0.034
270	0.018	0.022	0.025	0.026	0.028	0.029	0.030	0.030
290	0.017	0.019	0.021	0.023	0.025	0.026	0.027	0.028
310	0.017	0.018	0.020	0.022	0.023	0.024	0.026	0.027
330	0.018	0.019	0.020	0.021	0.022	0.023	0.024	0.025
350	0.019	0.019	0.020	0.021	0.022	0.023	0.024	0.025

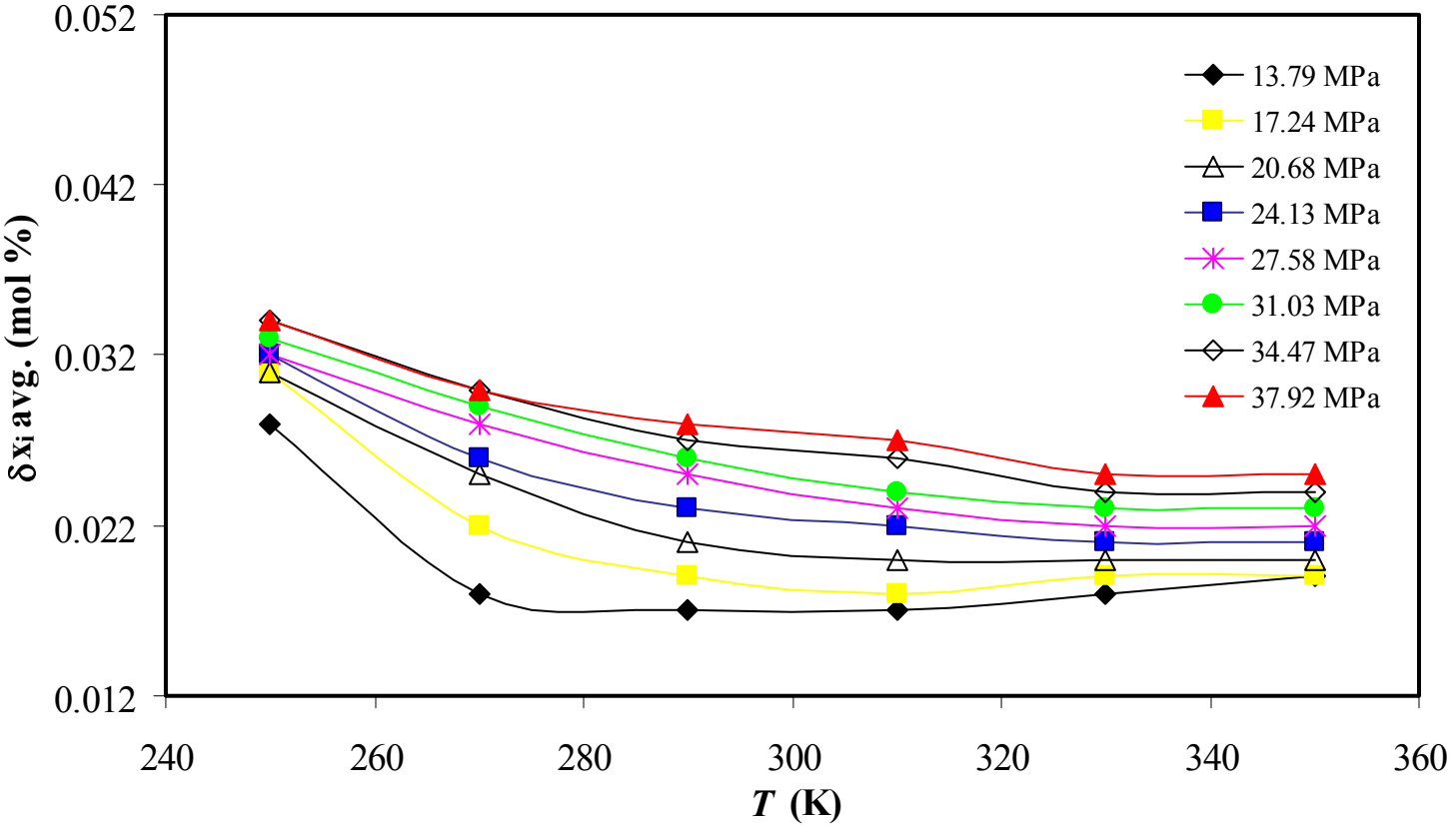

Figure 8. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture C Using SonicWare®

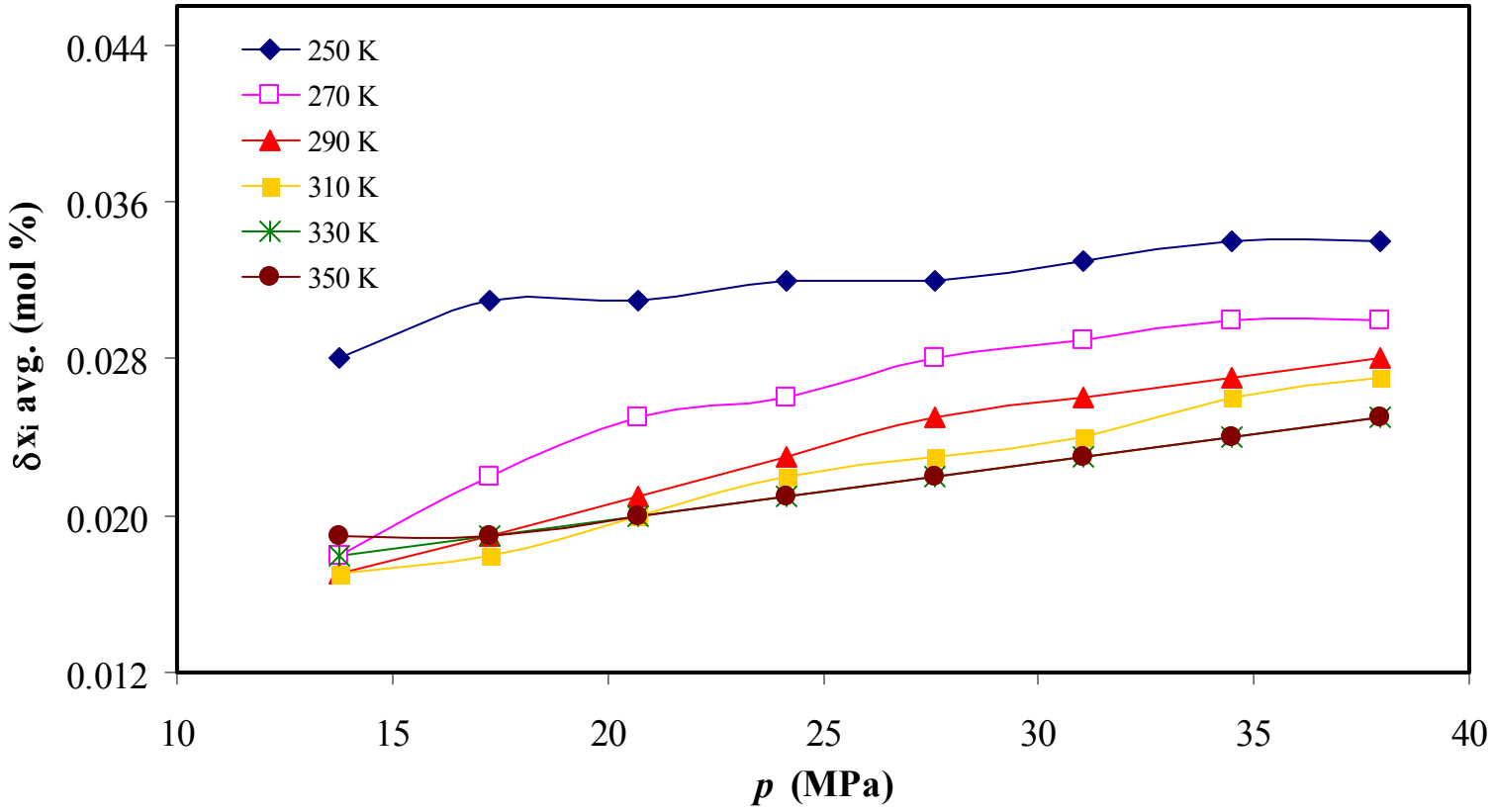

Figure 9. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Pressure for Gas Mixture C Using SonicWare®

Figure 10 shows the strange behavior that occurs, especially for case C at temperatures in the range 330 K to 350 K, when using NIST-14. The behavior should be smooth and systematic, not erratic as shown in the figure.

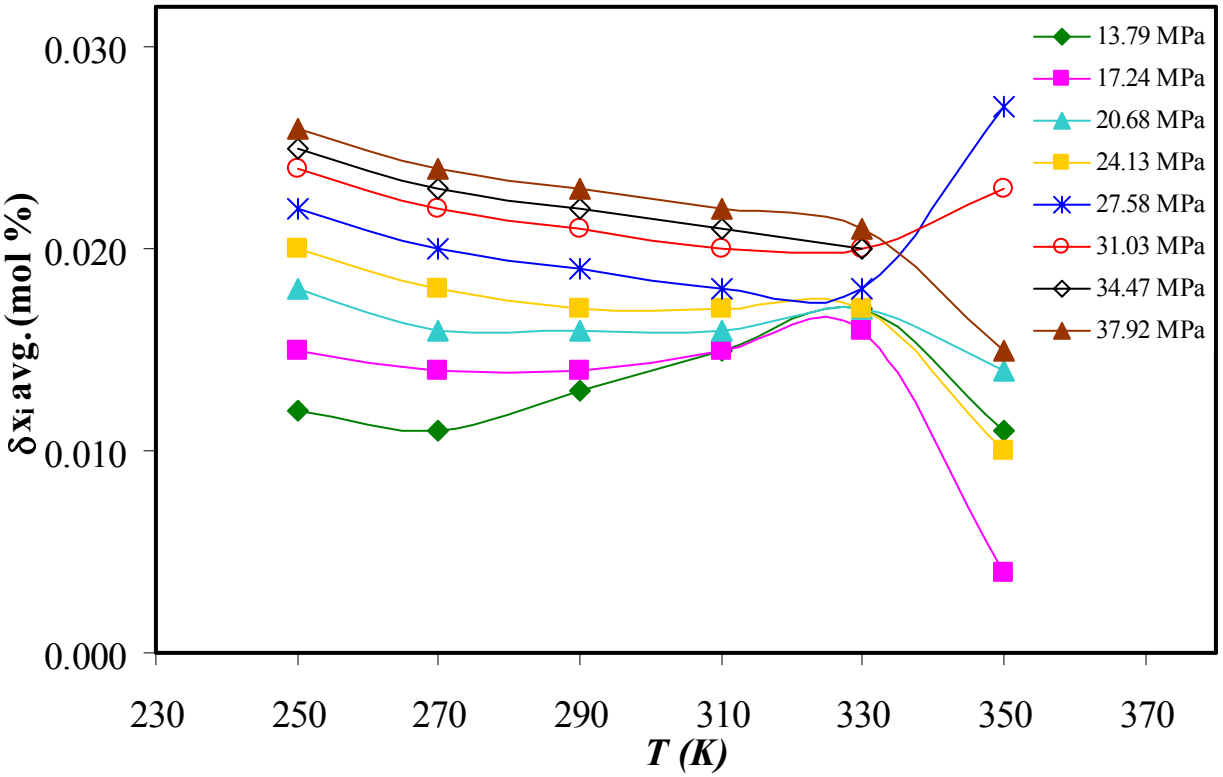

Figure 10. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture C Using NIST-14

Conclusions

The results obtained from this work, show that accuracies of the order of $\pm$ 0.02 mol % in composition measurement are required to obtained accuracies of $\pm$ 0.1 % in densities when using a combination of composition measurements and an equation of state calculation, especially when heavier hydrocarbons (*n*-heptane or heavier) are present in the gas mixture. This level of accuracy is very difficult to achieve, even when using the best sampling procedures and sampling techniques, and certified calibration gases for calibrating the chromatograph. Alternative approaches, such as direct density measurement, are no more accurate at sea-bed conditions, therefore it is very difficult to achieve high accuracy in gas flow measurement in offshore pipelines transmitting gas containing significant quantities of C_7^+ hydrocarbons.

NOMENCLATURE

a, b, c	= constant in various equation of state
a, b, c, A_o, B_o	= constant in Beattie-Bridgeman equation of state
A_0, B_0, C_0, a, b, c, α, γ	= constant for a given fluid
p	= pressure, MPa
R	= universal gas constant
^oC	= degrees Celcius
ρ	= density, kg/m^3
i	= component of a mixture
C7+	= heptanes and heavier fraction
Z	= compressibility factor
AGA	= American Gas Association
BBL	= barrel
BTU	= British thermal unit
Mpa	= mega pascal
MMSCFD	= million standard cubic feet per day
MBPD	= thousand barrel per day
MSCF	= thousand standard cubic feet
PVT	= pressure-volume-temperature
Psia	= pound per square inch
PT	= presure-temperature
T	= temperature, K
V_M	= molar volume
K	= Kelvins

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APPENDIX A

THE SONICWARE® CALCULATIONS

Tables A.1 to A.1.7 show calculations for the Case A gas mixture from 13.789 to 37.921 MPa and temperature from 270 K to 350 K. Tables A.2 to A.2.7 show calculations for the Case B gas mixture from 13.789 to 37.921 MPa and temperature from 260 K to 350 K. Tables A.3 to A.3.7 show calculations for the Case C gas mixture from 13.789 to 37.921 MPa and temperature from 250 K to 350 K

Table A.1. SonicWare® Calculations for the Case A Gas Mixture at 13.79 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	323.4398	1453.50	4.49388	0.02225
	0.6749	0.0017	324.8933	1448.00	4.45685	0.02244
	0.6739	0.0027	326.3413	1442.40	4.41991	0.02262
	0.6729	0.0037	327.7837	1436.70	4.38307	0.02282
	0.6719	0.0047	329.2204	1430.90	4.34633	0.02301
	0.6709	0.0057	330.6513	1425.00	4.30968	0.02320
	0.6699	0.0067	332.0763	1419.00	4.27311	0.02340
	0.6689	0.0077	333.4953	1413.10	4.23724	0.02360
	0.6679	0.0087	334.9084	1406.90	4.20085	0.02380
	0.6669	0.0097	336.3153	1400.80	4.16514	0.02401
	0.6659	0.0107	337.7161			
					δx_i avg. =	0.023
290 K	0.6759	0.0007	269.9488	1570.50	5.81777	0.01719
	0.6749	0.0017	271.5193	1573.40	5.79480	0.01726
	0.6739	0.0027	273.0927	1576.40	5.77240	0.01732
	0.6729	0.0037	274.6691	1579.30	5.74983	0.01739
	0.6719	0.0047	276.2484	1582.20	5.72745	0.01746
	0.6709	0.0057	277.8306	1585.00	5.70492	0.01753
	0.6699	0.0067	279.4156	1587.90	5.68293	0.01760
	0.6689	0.0077	281.0035	1590.50	5.66007	0.01767
	0.6679	0.0087	282.594	1593.30	5.63812	0.01774
	0.6669	0.0097	284.1873	1595.90	5.61566	0.01781
	0.6659	0.0107	285.7832			
					δx_i avg. =	0.017
310 K	0.6759	0.0007	221.1093	1418.20	6.41402	0.01559
	0.6749	0.0017	222.5275	1425.10	6.40415	0.01561
	0.6739	0.0027	223.9526	1431.90	6.39376	0.01564
	0.6729	0.0037	225.3845	1438.70	6.38331	0.01567
	0.6719	0.0047	226.8232	1445.30	6.37192	0.01569
	0.6709	0.0057	228.2685	1451.90	6.36049	0.01572

Table A.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	229.7204	1458.40	6.34859	0.01575
	0.6689	0.0077	231.1788	1464.80	6.33622	0.01578
	0.6679	0.0087	232.6436	1471.10	6.32341	0.01581
	0.6669	0.0097	234.1147	1477.30	6.31015	0.01585
	0.6659	0.0107	235.592			
					δx_i avg. =	0.016
330 K	0.6759	0.0007	183.7686	1140.90	6.20835	0.01611
	0.6749	0.0017	184.9095	1148.40	6.21061	0.01610
	0.6739	0.0027	186.0579	1155.90	6.21258	0.01610
	0.6729	0.0037	187.2138	1163.50	6.21482	0.01609
	0.6719	0.0047	188.3773	1171.10	6.21678	0.01609
	0.6709	0.0057	189.5484	1178.80	6.21899	0.01608
	0.6699	0.0067	190.7272	1186.30	6.21988	0.01608
	0.6689	0.0077	191.9135	1194.10	6.22207	0.01607
	0.6679	0.0087	193.1076	1201.70	6.22296	0.01607
	0.6669	0.0097	194.3093	1209.50	6.22461	0.01607
	0.6659	0.0107	195.5188			
					δx_i avg. =	0.016
350 K	0.6759	0.0007	157.2915	898.00	5.70915	0.01752
	0.6749	0.0017	158.1895	903.70	5.71277	0.01750
	0.6739	0.0027	159.0932	909.50	5.71677	0.01749
	0.6729	0.0037	160.0027	915.50	5.72178	0.01748
	0.6719	0.0047	160.9182	921.30	5.72527	0.01747
	0.6709	0.0057	161.8395	927.30	5.72975	0.01745
5.73397	0.01744	0.0067	162.7668	933.30		
	0.6689	0.0077	163.7001	939.40	5.73854	0.01743
	0.6679	0.0087	164.6395	945.40	5.74224	0.01741
	0.6669	0.0097	165.5849	951.60	5.74690	0.01740
	0.6659	0.0107	166.5365			
					δx_i avg. =	0.017

Table A.1.1. SonicWare® Calculations for the Case A Gas Mixture at 17.237 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	345.8858	1285.30	3.71597	0.02691
	0.6749	0.0017	347.1711	1280.60	3.68867	0.02711
	0.6739	0.0027	348.4517	1275.90	3.66163	0.02731
	0.6729	0.0037	349.7276	1271.20	3.63483	0.02751
	0.6719	0.0047	350.9988	1266.40	3.60799	0.02772
	0.6709	0.0057	352.2652	1261.80	3.58196	0.02792
	0.6699	0.0067	353.5270	1257.00	3.55560	0.02812
	0.6689	0.0077	354.7840	1252.20	3.52947	0.02833
	0.6679	0.0087	356.0362	1247.60	3.50414	0.02854
	0.6669	0.0097	357.2838	1242.90	3.47875	0.02875
	0.6659	0.0107	358.5267			
					δx_i avg. =	0.028
290 K	0.6759	0.0007	304.0461	1408.70	4.63318	0.02158
	0.6749	0.0017	305.4548	1408.90	4.61247	0.02168
	0.6739	0.0027	306.8637	1409.00	4.59162	0.02178
	0.6729	0.0037	308.2727	1408.90	4.57030	0.02188
	0.6719	0.0047	309.6816	1408.60	4.54854	0.02199
	0.6709	0.0057	311.0902	1408.40	4.52730	0.02209
	0.6699	0.0067	312.4986	1407.90	4.50530	0.02220
	0.6689	0.0077	313.9065	1407.30	4.48318	0.02231
	0.6679	0.0087	315.3138	1406.70	4.46127	0.02242
	0.6669	0.0097	316.7205	1405.80	4.43861	0.02253
	0.6659	0.0107	318.1263			
					δx_i avg. =	0.022
310 K	0.6759	0.0007	262.2239	1365.30	5.20662	0.01921
	0.6749	0.0017	263.5892	1368.80	5.19293	0.01926
	0.6739	0.0027	264.9580	1372.20	5.17893	0.01931
	0.6729	0.0037	266.3302	1375.40	5.16427	0.01936
	0.6719	0.0047	267.7056	1378.80	5.15043	0.01942
	0.6709	0.0057	269.0844	1381.90	5.13556	0.01947

Table A.1.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	270.4663	1385.00	5.12079	0.01953
	0.6689	0.0077	271.8513	1388.00	5.10573	0.01959
	0.6679	0.0087	273.2393	1391.00	5.09078	0.01964
	0.6669	0.0097	274.6303	1393.90	5.07555	0.01970
	0.6659	0.0107	276.0242			
					δx_i avg. =	0.019
330 K	0.6759	0.0007	225.6153	1218.30	5.39990	0.01852
	0.6749	0.0017	226.8336	1223.30	5.39294	0.01854
	0.6739	0.0027	228.0569	1228.20	5.38550	0.01857
	0.6729	0.0037	229.2851	1233.20	5.37846	0.01859
	0.6719	0.0047	230.5183	1238.00	5.37051	0.01862
	0.6709	0.0057	231.7563	1242.90	5.36296	0.01865
	0.6699	0.0067	232.9992	1247.70	5.35495	0.01867
	0.6689	0.0077	234.2469	1252.50	5.34692	0.01870
	0.6679	0.0087	235.4994	1257.20	5.33844	0.01873
	0.6669	0.0097	236.7566	1262.00	5.33037	0.01876
	0.6659	0.0107	238.0186			
					δx_i avg. =	0.019
350 K	0.6759	0.0007	196.2816	1035.90	5.27762	0.01895
	0.6749	0.0017	197.3175	1040.80	5.27475	0.01896
	0.6739	0.0027	198.3583	1045.60	5.27127	0.01897
	0.6729	0.0037	199.4039	1050.50	5.26820	0.01898
	0.6719	0.0047	200.4544	1055.30	5.26454	0.01900
	0.6709	0.0057	201.5097	1060.20	5.26129	0.01901
	0.6699	0.0067	202.5699	1065.00	5.25744	0.01902
	0.6689	0.0077	203.6349	1069.90	5.25401	0.01903
	0.6679	0.0087	204.7048	1074.80	5.25049	0.01905
	0.6669	0.0097	205.7796	1079.60	5.24639	0.01906
	0.6659	0.0107	206.8592			
					δx_i avg. =	0.019

Table A.1.2. SonicWare® Calculations for the Case A Gas Mixture at 20.684 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	361.4636	1197.90	3.31403	0.03017
	0.6749	0.0017	362.6615	1193.90	3.29205	0.03038
	0.6739	0.0027	363.8554	1190.00	3.27053	0.03058
	0.6729	0.0037	365.0454	1186.00	3.24891	0.03078
	0.6719	0.0047	366.2314	1182.00	3.22747	0.03098
	0.6709	0.0057	367.4134	1178.10	3.20647	0.03119
	0.6699	0.0067	368.5915	1174.20	3.18564	0.03139
	0.6689	0.0077	369.7657	1170.30	3.16498	0.03160
	0.6679	0.0087	370.9360	1166.40	3.14448	0.03180
	0.6669	0.0097	372.1024	1162.60	3.12441	0.03201
	0.6659	0.0107	373.2650			
					δx_i avg. =	0.031
290 K	0.6759	0.0007	326.2439	1292.50	3.96176	0.02524
	0.6749	0.0017	327.5364	1291.60	3.94338	0.02536
	0.6739	0.0027	328.8280	1290.50	3.92454	0.02548
	0.6729	0.0037	330.1185	1289.30	3.90557	0.02560
	0.6719	0.0047	331.4078	1288.00	3.88645	0.02573
	0.6709	0.0057	332.6958	1286.80	3.86780	0.02585
	0.6699	0.0067	333.9826	1285.30	3.84840	0.02598
	0.6689	0.0077	335.2679	1283.80	3.82918	0.02612
	0.6679	0.0087	336.5517	1282.20	3.80982	0.02625
	0.6669	0.0097	337.8339	1280.70	3.79092	0.02638
	0.6659	0.0107	339.1146			
					δx_i avg. =	0.026
310 K	0.6759	0.0007	290.3246	1286.30	4.43056	0.02257
	0.6749	0.0017	291.6109	1288.00	4.41684	0.02264
	0.6739	0.0027	292.8989	1289.60	4.40288	0.02271
	0.6729	0.0037	294.1885	1291.00	4.38834	0.02279
	0.6719	0.0047	295.4795	1292.50	4.37425	0.02286
	0.6709	0.0057	296.7720	1293.80	4.35958	0.02294

Table A.1.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	298.0658	1295.10	4.34501	0.02301
	0.6689	0.0077	299.3609	1296.30	4.33022	0.02309
	0.6679	0.0087	300.6572	1297.40	4.31521	0.02317
	0.6669	0.0097	301.9546	1298.50	4.30032	0.02325
	0.6659	0.0107	303.2531			
					δx_i avg. =	0.023
330 K	0.6759	0.0007	256.9479	1205.40	4.69122	0.02132
	0.6749	0.0017	258.1533	1208.40	4.68094	0.02136
	0.6739	0.0027	259.3617	1211.30	4.67031	0.02141
	0.6729	0.0037	260.5730	1214.10	4.65935	0.02146
	0.6719	0.0047	261.7871	1217.00	4.64882	0.02151
	0.6709	0.0057	263.0041	1219.70	4.63757	0.02156
	0.6699	0.0067	264.2238	1222.40	4.62638	0.02162
	0.6689	0.0077	265.4462	1225.00	4.61487	0.02167
	0.6679	0.0087	266.6712	1227.70	4.60380	0.02172
	0.6669	0.0097	267.8989	1230.30	4.59240	0.02178
	0.6659	0.0107	269.1292			
					δx_i avg. =	0.022
350 K	0.6759	0.0007	228.0134	1084.70	4.75718	0.02102
	0.6749	0.0017	229.0981	1088.00	4.74906	0.02106
	0.6739	0.0027	230.1861	1091.50	4.74182	0.02109
	0.6729	0.0037	231.2776	1094.80	4.73371	0.02113
	0.6719	0.0047	232.3724	1098.30	4.72646	0.02116
	0.6709	0.0057	233.4707	1101.50	4.71794	0.02120
	0.6699	0.0067	234.5722	1104.90	4.71028	0.02123
	0.6689	0.0077	235.6771	1108.20	4.70220	0.02127
	0.6679	0.0087	236.7853	1111.40	4.69370	0.02131
	0.6669	0.0097	237.8967	1114.70	4.68565	0.02134
	0.6659	0.0107	239.0114			
					δx_i avg. =	0.021

Table A.1.3. SonicWare® Calculations for the Case A Gas Mixture at 24.132 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	373.5786	1144.40	3.06334	0.03264
	0.6749	0.0017	374.7230	1140.90	3.04465	0.03284
	0.6739	0.0027	375.8639	1137.40	3.02610	0.03305
	0.6729	0.0037	377.0013	1134.00	3.00795	0.03325
	0.6719	0.0047	378.1353	1130.40	2.98941	0.03345
	0.6709	0.0057	379.2657	1127.10	2.97180	0.03365
	0.6699	0.0067	380.3928	1123.60	2.95379	0.03385
	0.6689	0.0077	381.5164	1120.30	2.93644	0.03405
	0.6679	0.0087	382.6367	1117.00	2.91922	0.03426
	0.6669	0.0097	383.7537	1113.60	2.90186	0.03446
	0.6659	0.0107	384.8673			
					δx_i avg. =	0.034
290 K	0.6759	0.0007	342.5642	1215.80	3.54912	0.02818
	0.6749	0.0017	343.7800	1214.40	3.53249	0.02831
	0.6739	0.0027	344.9944	1212.90	3.51571	0.02844
	0.6729	0.0037	346.2073	1211.40	3.49906	0.02858
	0.6719	0.0047	347.4187	1209.80	3.48225	0.02872
	0.6709	0.0057	348.6285	1208.20	3.46558	0.02886
	0.6699	0.0067	349.8367	1206.60	3.44904	0.02899
	0.6689	0.0077	351.0433	1204.80	3.43206	0.02914
	0.6679	0.0087	352.2481	1203.10	3.41549	0.02928
	0.6669	0.0097	353.4512	1201.30	3.39877	0.02942
	0.6659	0.0107	354.6525			
					δx_i avg. =	0.029
310 K	0.6759	0.0007	310.9030	1220.50	3.92566	0.02547
	0.6749	0.0017	312.1235	1220.90	3.91159	0.02557
	0.6739	0.0027	313.3444	1221.50	3.89827	0.02565
	0.6729	0.0037	314.5659	1221.80	3.88408	0.02575
	0.6719	0.0047	315.7877	1222.20	3.87032	0.02584
	0.6709	0.0057	317.0099	1222.40	3.85603	0.02593

Table A.1.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	318.2323	1222.60	3.84185	0.02603
	0.6689	0.0077	319.4549	1222.80	3.82777	0.02612
	0.6679	0.0087	320.6777	1222.80	3.81317	0.02622
	0.6669	0.0097	321.9005	1222.80	3.79869	0.02632
	0.6659	0.0107	323.1233			
					δx_i avg. =	0.026
330 K	0.6759	0.0007	280.6758	1170.60	4.17065	0.02398
	0.6749	0.0017	281.8464	1172.30	4.15936	0.02404
	0.6739	0.0027	283.0187	1173.90	4.14778	0.02411
	0.6729	0.0037	284.1926	1175.50	4.13628	0.02418
	0.6719	0.0047	285.3681	1177.00	4.12450	0.02425
	0.6709	0.0057	286.5451	1178.50	4.11279	0.02431
	0.6699	0.0067	287.7236	1180.00	4.10116	0.02438
	0.6689	0.0077	288.9036	1181.40	4.08925	0.02445
	0.6679	0.0087	290.0850	1182.80	4.07743	0.02453
	0.6669	0.0097	291.2678	1184.00	4.06499	0.02460
	0.6659	0.0107	292.4518			
					δx_i avg. =	0.024
350 K	0.6759	0.0007	253.3290	1088.90	4.29836	0.02326
	0.6749	0.0017	254.4179	1091.20	4.28901	0.02332
	0.6739	0.0027	255.5091	1093.30	4.27891	0.02337
	0.6729	0.0037	256.6024	1095.50	4.26925	0.02342
	0.6719	0.0047	257.6979	1097.50	4.25886	0.02348
	0.6709	0.0057	258.7954	1099.70	4.24930	0.02353
	0.6699	0.0067	259.8951	1101.70	4.23902	0.02359
	0.6689	0.0077	260.9968	1103.80	4.22917	0.02365
	0.6679	0.0087	262.1006	1105.70	4.21861	0.02370
	0.6669	0.0097	263.2063	1107.80	4.20887	0.02376
	0.6659	0.0107	264.3141			
					δx_i avg. =	0.024

Table A.1.4. SonicWare® Calculations for the Case A Gas Mixture at 27.579 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	383.5777	1108.30	2.88938	0.03461
	0.6749	0.0017	384.6860	1105.00	2.87247	0.03481
	0.6739	0.0027	385.7910	1102.00	2.85647	0.03501
	0.6729	0.0037	386.8930	1098.80	2.84006	0.03521
	0.6719	0.0047	387.9918	1095.70	2.82403	0.03541
	0.6709	0.0057	389.0875	1092.60	2.80811	0.03561
	0.6699	0.0067	390.1801	1089.60	2.79256	0.03581
	0.6689	0.0077	391.2697	1086.50	2.77686	0.03601
	0.6679	0.0087	392.3562	1083.60	2.76178	0.03621
	0.6669	0.0097	393.4398	1080.70	2.74680	0.03641
	0.6659	0.0107	394.5205			
					δx_i avg. =	0.036
290 K	0.6759	0.0007	355.4970	1162.90	3.27119	0.03057
	0.6749	0.0017	356.6599	1161.30	3.25604	0.03071
	0.6739	0.0027	357.8212	1159.70	3.24100	0.03085
	0.6729	0.0037	358.9809	1158.10	3.22608	0.03100
	0.6719	0.0047	360.1390	1156.40	3.21098	0.03114
	0.6709	0.0057	361.2954	1154.70	3.19600	0.03129
	0.6699	0.0067	362.4501	1153.00	3.18113	0.03144
	0.6689	0.0077	363.6031	1151.20	3.16609	0.03158
	0.6679	0.0087	364.7543	1149.40	3.15116	0.03173
	0.6669	0.0097	365.9037	1147.60	3.13634	0.03188
	0.6659	0.0107	367.0513			
					δx_i avg. =	0.031
310 K	0.6759	0.0007	326.9461	1169.30	3.57643	0.02796
	0.6749	0.0017	328.1154	1169.20	3.56338	0.02806
	0.6739	0.0027	329.2846	1169.10	3.55042	0.02817
	0.6729	0.0037	330.4357	1168.70	3.53665	0.02828
	0.6719	0.0047	331.6224	1168.50	3.52359	0.02838
	0.6709	0.0057	332.7909	1168.10	3.51001	0.02849

Table A.1.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	333.9590	1167.60	3.49624	0.02860
	0.6689	0.0077	335.1266	1167.20	3.48286	0.02871
	0.6679	0.0087	336.2938	1166.70	3.46929	0.02882
	0.6669	0.0097	337.4605	1166.10	3.45552	0.02894
	0.6659	0.0107	338.6266			
					δx_i avg. =	0.028
330 K	0.6759	0.0007	299.3337	1135.70	3.79409	0.02636
	0.6749	0.0017	300.4694	1136.60	3.78275	0.02644
	0.6739	0.0027	301.6060	1137.30	3.77081	0.02652
	0.6729	0.0037	302.7433	1138.10	3.75929	0.02660
	0.6719	0.0047	303.8814	1138.90	3.74784	0.02668
	0.6709	0.0057	305.0203	1139.50	3.73582	0.02677
	0.6699	0.0067	306.1598	1140.00	3.72355	0.02686
	0.6689	0.0077	307.2998	1140.70	3.71201	0.02694
	0.6679	0.0087	308.4405	1141.20	3.69990	0.02703
	0.6669	0.0097	309.5817	1141.70	3.68788	0.02712
	0.6659	0.0107	310.7234			
					δx_i avg. =	0.027
350 K	0.6759	0.0007	273.7469	1076.60	3.93283	0.02543
	0.6749	0.0017	274.8235	1078.00	3.92252	0.02549
	0.6739	0.0027	275.9015	1079.20	3.91154	0.02557
	0.6729	0.0037	276.9807	1080.60	3.90135	0.02563
	0.6719	0.0047	278.0613	1081.80	3.89051	0.02570
	0.6709	0.0057	279.1431	1083.00	3.87973	0.02577
	0.6699	0.0067	280.2261	1084.10	3.86866	0.02585
	0.6689	0.0077	281.3102	1085.40	3.85837	0.02592
	0.6679	0.0087	282.3956	1086.40	3.84709	0.02599
	0.6669	0.0097	283.4820	1087.50	3.83622	0.02607
	0.6659	0.0107	284.5695			
	0.6649	0.0117			δx_i avg. =	0.026

Table A.1.5. SonicWare® Calculations for the Case A Gas Mixture at 31.026 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	392.1394	1082.30	2.75999	0.03623
	0.6749	0.0017	393.2217	1079.30	2.74476	0.03643
	0.6739	0.0027	394.3010	1076.40	2.72989	0.03663
	0.6729	0.0037	395.3774	1073.50	2.71513	0.03683
	0.6719	0.0047	396.4509	1070.70	2.70071	0.03703
	0.6709	0.0057	397.5216	1067.80	2.68614	0.03723
	0.6699	0.0067	398.5894	1065.10	2.67217	0.03742
	0.6689	0.0077	399.6545	1062.40	2.65830	0.03762
	0.6679	0.0087	400.7169	1059.60	2.64426	0.03782
	0.6669	0.0097	401.7765	1056.90	2.63057	0.03801
	0.6659	0.0107	402.8334			
					δx_i avg. =	0.037
290 K	0.6759	0.0007	366.2439	1124.60	3.07063	0.03257
	0.6749	0.0017	367.3685	1123.00	3.05688	0.03271
	0.6739	0.0027	368.4915	1121.30	3.04295	0.03286
	0.6729	0.0037	369.6128	1119.60	3.02912	0.03301
	0.6719	0.0047	370.7324	1117.90	3.01538	0.03316
	0.6709	0.0057	371.8503	1116.20	3.00175	0.03331
	0.6699	0.0067	372.9665	1114.40	2.98794	0.03347
	0.6689	0.0077	374.0809	1112.60	2.97422	0.03362
	0.6679	0.0087	375.1935	1110.90	2.96087	0.03377
	0.6669	0.0097	376.3044	1109.10	2.94735	0.03393
	0.6659	0.0107	377.4135			
					δx_i avg. =	0.033
310 K	0.6759	0.0007	340.0475	1130.00	3.32307	0.03009
	0.6749	0.0017	341.1775	1129.40	3.31030	0.03021
	0.6739	0.0027	342.3069	1128.80	3.29763	0.03032
	0.6729	0.0037	343.4357	1128.20	3.28504	0.03044
	0.6719	0.0047	344.5639	1127.50	3.27225	0.03056
	0.6709	0.0057	345.6914	1126.70	3.25927	0.03068

Table A.1.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	346.8181	1125.90	3.24637	0.03080
	0.6689	0.0077	347.9440	1125.10	3.23357	0.03093
	0.6679	0.0087	349.0691	1124.30	3.22085	0.03105
	0.6669	0.0097	350.1934	1123.30	3.20766	0.03118
	0.6659	0.0107	351.3167			
					δx_i avg. =	0.031
330 K	0.6759	0.0007	314.5547	1105.30	3.51386	0.02846
	0.6749	0.0017	315.6600	1105.50	3.50219	0.02855
	0.6739	0.0027	316.7655	1105.70	3.49059	0.02865
	0.6729	0.0037	317.8712	1105.90	3.47908	0.02874
	0.6719	0.0047	318.9771	1106.00	3.46733	0.02884
	0.6709	0.0057	320.0831	1106.10	3.45567	0.02894
	0.6699	0.0067	321.1892	1106.10	3.44376	0.02904
	0.6689	0.0077	322.2953	1106.10	3.43195	0.02914
	0.6679	0.0087	323.4014	1106.10	3.42021	0.02924
	0.6669	0.0097	324.5075	1106.00	3.40824	0.02934
	0.6659	0.0107	325.6135			
					δx_i avg. =	0.029
350 K	0.6759	0.0007	290.5867	1060.00	3.64779	0.02741
	0.6749	0.0017	291.6467	1060.70	3.63693	0.02750
	0.6739	0.0027	292.7074	1061.40	3.62615	0.02758
	0.6729	0.0037	293.7688	1062.10	3.61543	0.02766
	0.6719	0.0047	294.8309	1062.60	3.60410	0.02775
	0.6709	0.0057	295.8935	1063.30	3.59352	0.02783
	0.6699	0.0067	296.9568	1063.80	3.58234	0.02791
	0.6689	0.0077	298.0206	1064.40	3.57157	0.02800
	0.6679	0.0087	299.0850	1064.80	3.56019	0.02809
	0.6669	0.0097	300.1498	1065.30	3.54923	0.02818
	0.6659	0.0107	301.2151			
	0.6649	0.0117			δx_i avg. =	0.028

Table A.1.6. SonicWare® Calculations for the Case A Gas Mixture at 34.474 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	399.6562	1062.60	2.65879	0.03761
	0.6749	0.0017	400.7188	1059.90	2.64500	0.03781
	0.6739	0.0027	401.7787	1057.20	2.63130	0.03800
	0.6729	0.0037	402.8359	1054.50	2.61769	0.03820
	0.6719	0.0047	403.8904	1051.90	2.60442	0.03840
	0.6709	0.0057	404.9423	1049.20	2.59099	0.03860
	0.6699	0.0067	405.9915	1046.70	2.57813	0.03879
	0.6689	0.0077	407.0382	1044.10	2.56512	0.03898
	0.6679	0.0087	408.0823	1041.60	2.55243	0.03918
	0.6669	0.0097	409.1239	1039.20	2.54006	0.03937
	0.6659	0.0107	410.1631			
					δx_i avg. =	0.038
290 K	0.6759	0.0007	375.4659	1095.80	2.91851	0.03426
	0.6749	0.0017	376.5617	1094.00	2.90523	0.03442
	0.6739	0.0027	377.6557	1092.40	2.89258	0.03457
	0.6729	0.0037	378.7481	1090.70	2.87975	0.03473
	0.6719	0.0047	379.8388	1088.90	2.86674	0.03488
	0.6709	0.0057	380.9277	1087.20	2.85408	0.03504
	0.6699	0.0067	382.0149	1085.50	2.84151	0.03519
	0.6689	0.0077	383.1004	1083.70	2.82876	0.03535
	0.6679	0.0087	384.1841	1081.90	2.81610	0.03551
	0.6669	0.0097	385.2660	1080.20	2.80378	0.03567
	0.6659	0.0107	386.3462			
					δx_i avg. =	0.035
310 K	0.6759	0.0007	351.1154	1099.20	3.13059	0.03194
	0.6749	0.0017	352.2146	1098.40	3.11855	0.03207
	0.6739	0.0027	353.3130	1097.50	3.10631	0.03219
	0.6729	0.0037	354.4105	1096.60	3.09415	0.03232
	0.6719	0.0047	355.5071	1095.70	3.08208	0.03245
	0.6709	0.0057	356.6028	1094.60	3.06952	0.03258

Table A.1.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	357.6974	1093.70	3.05761	0.03271
	0.6689	0.0077	358.7911	1092.60	3.04523	0.03284
	0.6679	0.0087	359.8837	1091.60	3.03320	0.03297
	0.6669	0.0097	360.9753	1090.40	3.02071	0.03310
	0.6659	0.0107	362.0657			
					δx_i avg. =	0.032
330 K	0.6759	0.0007	327.3509	1079.50	3.29768	0.03032
	0.6749	0.0017	328.4304	1079.40	3.28654	0.03043
	0.6739	0.0027	329.5098	1079.20	3.27517	0.03053
	0.6729	0.0037	330.5890	1078.90	3.26357	0.03064
	0.6719	0.0047	331.6679	1078.60	3.25205	0.03075
	0.6709	0.0057	332.7465	1078.30	3.24061	0.03086
	0.6699	0.0067	333.8248	1077.90	3.22894	0.03097
	0.6689	0.0077	334.9027	1077.50	3.21735	0.03108
	0.6679	0.0087	335.9802	1077.10	3.20584	0.03119
	0.6669	0.0097	337.0573	1076.60	3.19412	0.03131
	0.6659	0.0107	338.1339			
					δx_i avg. =	0.031
350 K	0.6759	0.0007	304.8007	1043.30	3.42289	0.02922
	0.6749	0.0017	305.8440	1043.70	3.41252	0.02930
	0.6739	0.0027	306.8877	1043.80	3.40124	0.02940
	0.6729	0.0037	307.9315	1044.00	3.39036	0.02950
	0.6719	0.0047	308.9755	1044.20	3.37956	0.02959
	0.6709	0.0057	310.0197	1044.20	3.36817	0.02969
	0.6699	0.0067	311.0639	1044.40	3.35751	0.02978
	0.6689	0.0077	312.1083	1044.40	3.34627	0.02988
	0.6679	0.0087	313.1527	1044.50	3.33543	0.02998
	0.6669	0.0097	314.1972	1044.40	3.32403	0.03008
	0.6659	0.0107	315.2416			
	0.6649	0.0117			δx_i avg. =	0.030

Table A.1.7 SonicWare® Calculations for the Case A Gas Mixture at 37.921 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6759	0.0007	406.3762	1047.40	2.57741	0.03880
	0.6749	0.0017	407.4236	1044.90	2.56465	0.03899
	0.6739	0.0027	408.4685	1042.20	2.55148	0.03919
	0.6729	0.0037	409.5107	1039.70	2.53888	0.03939
	0.6719	0.0047	410.5504	1037.30	2.52661	0.03958
	0.6709	0.0057	411.5877	1034.80	2.51417	0.03977
	0.6699	0.0067	412.6225	1032.30	2.50180	0.03997
	0.6689	0.0077	413.6548	1030.00	2.49000	0.04016
	0.6679	0.0087	414.6848	1027.70	2.47827	0.04035
	0.6669	0.0097	415.7125	1025.30	2.46637	0.04055
	0.6659	0.0107	416.7378			
					δx_i avg. =	0.040
290 K	0.6759	0.0007	383.5634	1073.30	2.79823	0.03574
	0.6749	0.0017	384.6367	1071.50	2.78575	0.03590
	0.6739	0.0027	385.7082	1069.90	2.77386	0.03605
	0.6729	0.0037	386.7781	1068.20	2.76179	0.03621
	0.6719	0.0047	387.8463	1066.40	2.74954	0.03637
	0.6709	0.0057	388.9127	1064.70	2.73763	0.03653
	0.6699	0.0067	389.9774	1062.90	2.72554	0.03669
	0.6689	0.0077	391.0403	1061.20	2.71379	0.03685
	0.6679	0.0087	392.1015	1059.50	2.70211	0.03701
	0.6669	0.0097	393.1610	1057.70	2.69025	0.03717
	0.6659	0.0107	394.2187			
					δx_i avg. =	0.036
310 K	0.6759	0.0007	360.7033	1074.80	2.97973	0.03356
	0.6749	0.0017	361.7781	1073.70	2.96784	0.03369
	0.6739	0.0027	362.8518	1072.70	2.95630	0.03383
	0.6729	0.0037	363.9245	1071.60	2.94457	0.03396
	0.6719	0.0047	364.9961	1070.50	2.93291	0.03410
	0.6709	0.0057	366.0666	1069.30	2.92105	0.03423

Table A.1.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
310 K	0.6699	0.0067	367.1359	1068.20	2.90955	0.03437
	0.6689	0.0077	368.2041	1067.00	2.89785	0.03451
	0.6679	0.0087	369.2711	1065.80	2.88623	0.03465
	0.6669	0.0097	370.3369	1064.50	2.87441	0.03479
	0.6659	0.0107	371.4014			
					δx_i avg. =	0.034
330 K	0.6759	0.0007	338.3677	1058.10	3.12707	0.03198
	0.6749	0.0017	339.4258	1057.50	3.11556	0.03210
	0.6739	0.0027	340.4833	1057.10	3.10470	0.03221
	0.6729	0.0037	341.5404	1056.40	3.09305	0.03233
	0.6719	0.0047	342.5968	1055.90	3.08205	0.03245
	0.6709	0.0057	343.6527	1055.30	3.07083	0.03256
	0.6699	0.0067	344.7080	1054.60	3.05940	0.03269
	0.6689	0.0077	345.7626	1053.90	3.04805	0.03281
	0.6679	0.0087	346.8165	1053.20	3.03676	0.03293
	0.6669	0.0097	347.8697	1052.40	3.02527	0.03305
	0.6659	0.0107	348.9221			
					δx_i avg. =	0.033
350 K	0.6759	0.0007	317.0449	1028.00	3.24244	0.03084
	0.6749	0.0017	318.0729	1027.90	3.23165	0.03094
	0.6739	0.0027	319.1008	1027.80	3.22093	0.03105
	0.6729	0.0037	320.1286	1027.60	3.20996	0.03115
	0.6719	0.0047	321.1562	1027.30	3.19875	0.03126
	0.6709	0.0057	322.1835	1027.10	3.18793	0.03137
	0.6699	0.0067	323.2106	1026.90	3.17719	0.03147
	0.6689	0.0077	324.2375	1026.60	3.16620	0.03158
	0.6679	0.0087	325.2641	1026.20	3.15497	0.03170
	0.6669	0.0097	326.2903	1025.90	3.14413	0.03181
	0.6659	0.0107	327.3162			
	0.6649	0.0117			δx_i avg. =	0.031

Table A.2. SonicWare® Calculations for the Case B Gas Mixture at 13.79 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	307.2537	1370.90	4.46179	0.02241
	0.7092	0.0013	308.6246	1364.40	4.42090	0.02262
	0.7082	0.0023	309.9890	1357.90	4.38048	0.02283
	0.7072	0.0033	311.3469	1351.40	4.34050	0.02304
	0.7062	0.0043	312.6983	1344.60	4.29999	0.02326
	0.7052	0.0053	314.0429	1338.00	4.26056	0.02347
	0.7042	0.0063	315.3809	1331.20	4.22093	0.02369
	0.7032	0.0073	316.7121	1324.40	4.18172	0.02391
	0.7022	0.0083	318.0365	1317.50	4.14261	0.02414
	0.7012	0.0093	319.3540	1310.60	4.10391	0.02437
	0.7002	0.0103	320.6646			
					δx_i avg. =	0.023
270 K	0.7102	0.0003	279.6837	1454.00	5.19873	0.01924
	0.7092	0.0013	281.1377	1453.00	5.16829	0.01935
	0.7082	0.0023	282.5907	1452.00	5.13817	0.01946
	0.7072	0.0033	284.0427	1450.90	5.10803	0.01958
	0.7062	0.0043	285.4936	1449.90	5.07857	0.01969
	0.7052	0.0053	286.9435	1448.80	5.04908	0.01981
	0.7042	0.0063	288.3923	1447.70	5.01990	0.01992
	0.7032	0.0073	289.8400	1446.60	4.99103	0.02004
	0.7022	0.0083	291.2866	1445.40	4.96212	0.02015
	0.7012	0.0093	292.7320	1444.20	4.93352	0.02027
	0.7002	0.0103	294.1762			
					δx_i avg. =	0.020
290 K	0.7102	0.0003	226.9595	1426.80	6.28658	0.01591
	0.7092	0.0013	228.3863	1432.10	6.27052	0.01595
	0.7082	0.0023	229.8184	1437.20	6.25363	0.01599
	0.7072	0.0033	231.2556	1442.20	6.23639	0.01603
	0.7062	0.0043	232.6978	1447.10	6.21880	0.01608
	0.7052	0.0053	234.1449	1451.80	6.20043	0.01613

Table A.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	235.5967	1456.50	6.18217	0.01618
	0.7032	0.0073	237.0532	1461.00	6.16317	0.01623
	0.7022	0.0083	238.5142	1465.40	6.14387	0.01628
	0.7012	0.0093	239.9796	1469.70	6.12427	0.01633
	0.7002	0.0103	241.4493			
					δx_i avg. =	0.016
310 K	0.7102	0.0003	185.6573	1190.50	6.41235	0.01559
	0.7092	0.0013	186.8478	1198.40	6.41378	0.01559
	0.7082	0.0023	188.0462	1206.20	6.41438	0.01559
	0.7072	0.0033	189.2524	1214.10	6.41524	0.01559
	0.7062	0.0043	190.4665	1221.90	6.41530	0.01559
	0.7052	0.0053	191.6884	1229.90	6.41614	0.01559
	0.7042	0.0063	192.9183	1237.70	6.41567	0.01559
	0.7032	0.0073	194.1560	1245.60	6.41546	0.01559
	0.7022	0.0083	195.4016	1253.50	6.41499	0.01559
	0.7012	0.0093	196.6551	1261.40	6.41428	0.01559
	0.7002	0.0103	197.9165			
					δx_i avg. =	0.016
330 K	0.7102	0.0003	156.8447	940.90	5.99893	0.01667
	0.7092	0.0013	157.7856	947.50	6.00498	0.01665
	0.7082	0.0023	158.7331	954.00	6.01009	0.01664
	0.7072	0.0033	159.6871	960.70	6.01614	0.01662
	0.7062	0.0043	160.6478	967.20	6.02062	0.01661
	0.7052	0.0053	161.6150	973.90	6.02605	0.01659
	0.7042	0.0063	162.5889	980.60	6.03116	0.01658
	0.7032	0.0073	163.5695	987.40	6.03658	0.01657
	0.7022	0.0083	164.5569	994.30	6.04229	0.01655
	0.7012	0.0093	165.5512	1001.00	6.04647	0.01654
	0.7002	0.0103	166.5522			
					δx_i avg. =	0.017

Table A.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	136.7209	755.10	5.52293	0.01811
	0.7092	0.0013	137.4760	759.80	5.52678	0.01809
	0.7082	0.0023	138.2358	764.40	5.52968	0.01808
	0.7072	0.0033	139.0002	769.00	5.53237	0.01808
	0.7062	0.0043	139.7692	773.80	5.53627	0.01806
	0.7052	0.0053	140.5430	778.50	5.53923	0.01805
	0.7042	0.0063	141.3215	783.30	5.54268	0.01804
	0.7032	0.0073	142.1048	788.20	5.54661	0.01803
	0.7022	0.0083	142.8930	793.00	5.54961	0.01802
	0.7012	0.0093	143.6860	798.00	5.55378	0.01801
	0.7002	0.0103	144.4840			
					δx_i avg. =	0.018

Table A.2.1. SonicWare® Calculations for the Case B Gas Mixture at 17.237 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	331.7075	1257.50	3.79099	0.02638
	0.7092	0.0013	332.9650	1251.30	3.75805	0.02661
	0.7082	0.0023	334.2163	1245.30	3.72603	0.02684
	0.7072	0.0033	335.4616	1239.00	3.69342	0.02708
	0.7062	0.0043	336.7006	1232.90	3.66171	0.02731
	0.7052	0.0053	337.9335	1226.70	3.63000	0.02755
	0.7042	0.0063	339.1602	1220.40	3.59830	0.02779
	0.7032	0.0073	340.3806	1214.10	3.56689	0.02804
	0.7022	0.0083	341.5947	1207.80	3.53577	0.02828
	0.7012	0.0093	342.8025	1201.50	3.50493	0.02853
	0.7002	0.0103	344.0040			
					δx_i avg. =	0.027
270 K	0.7102	0.0003	310.2375	1333.30	4.29768	0.02327
	0.7092	0.0013	311.5708	1331.50	4.27351	0.02340
	0.7082	0.0023	312.9023	1329.70	4.24957	0.02353
	0.7072	0.0033	314.2320	1327.60	4.22490	0.02367
	0.7062	0.0043	315.5596	1325.60	4.20079	0.02381
	0.7052	0.0053	316.8852	1323.50	4.17659	0.02394
	0.7042	0.0063	318.2087	1321.10	4.15168	0.02409
	0.7032	0.0073	319.5298	1318.80	4.12731	0.02423
	0.7022	0.0083	320.8486	1316.40	4.10287	0.02437
	0.7012	0.0093	322.1650	1313.80	4.07803	0.02452
	0.7002	0.0103	323.4788			
					δx_i avg. =	0.024
290 K	0.7102	0.0003	266.7243	1352.00	5.06890	0.01973
	0.7092	0.0013	268.0763	1355.30	5.05565	0.01978
	0.7082	0.0023	269.4316	1358.40	5.04172	0.01983
	0.7072	0.0033	270.7900	1361.50	5.02788	0.01989
	0.7062	0.0043	272.1515	1364.60	5.01412	0.01994
	0.7052	0.0053	273.5161	1367.60	5.00007	0.02000

Table A.2.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	274.8837	1370.40	4.98538	0.02006
	0.7032	0.0073	276.2541	1373.30	4.97115	0.02012
	0.7022	0.0083	277.6274	1376.10	4.95664	0.02017
	0.7012	0.0093	279.0035	1378.70	4.94152	0.02024
	0.7002	0.0103	280.3822			
					δx_i avg. =	0.020
310 K	0.7102	0.0003	227.5562	1246.40	5.47733	0.01826
	0.7092	0.0013	228.8026	1251.80	5.47109	0.01828
	0.7082	0.0023	230.0544	1257.00	5.46393	0.01830
	0.7072	0.0033	231.3114	1262.30	5.45715	0.01832
	0.7062	0.0043	232.5737	1267.50	5.44989	0.01835
	0.7052	0.0053	233.8412	1272.80	5.44301	0.01837
	0.7042	0.0063	235.1140	1277.80	5.43481	0.01840
	0.7032	0.0073	236.3918	1282.90	5.42701	0.01843
	0.7022	0.0083	237.6747	1288.00	5.41917	0.01845
	0.7012	0.0093	238.9627	1292.90	5.41047	0.01848
	0.7002	0.0103	240.2556			
					δx_i avg. =	0.018
330 K	0.7102	0.0003	196.0125	1075.10	5.48485	0.01823
	0.7092	0.0013	197.0876	1080.60	5.48284	0.01824
	0.7082	0.0023	198.1682	1086.10	5.48070	0.01825
	0.7072	0.0033	199.2543	1091.50	5.47792	0.01826
	0.7062	0.0043	200.3458	1097.10	5.47603	0.01826
	0.7052	0.0053	201.4429	1102.50	5.47301	0.01827
	0.7042	0.0063	202.5454	1108.10	5.47087	0.01828
	0.7032	0.0073	203.6535	1113.50	5.46762	0.01829
	0.7022	0.0083	204.7670	1119.10	5.46524	0.01830
	0.7012	0.0093	205.8861	1124.50	5.46176	0.01831
	0.7002	0.0103	207.0106			
					δx_i avg. =	0.018

Table A.2.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	171.9121	908.60	5.28526	0.01892
	0.7092	0.0013	172.8207	913.30	5.28467	0.01892
	0.7082	0.0023	173.7340	917.70	5.28221	0.01893
	0.7072	0.0033	174.6517	922.40	5.28137	0.01893
	0.7062	0.0043	175.5741	927.00	5.27982	0.01894
	0.7052	0.0053	176.5011	931.70	5.27872	0.01894
	0.7042	0.0063	177.4328	936.30	5.27693	0.01895
	0.7032	0.0073	178.3691	940.90	5.27502	0.01896
	0.7022	0.0083	179.3100	945.70	5.27411	0.01896
	0.7012	0.0093	180.2557	950.40	5.27251	0.01897
	0.7002	0.0103	181.2061			
					δx_i avg. =	0.019

Table A.2.2. SonicWare® Calculations for the Case B Gas Mixture at 20.684 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	348.3850	1189.30	3.41375	0.02929
	0.7092	0.0013	349.5743	1183.70	3.38612	0.02953
	0.7082	0.0023	350.7580	1178.20	3.35901	0.02977
	0.7072	0.0033	351.9362	1172.50	3.33157	0.03002
	0.7062	0.0043	353.1087	1166.90	3.30465	0.03026
	0.7052	0.0053	354.2756	1161.20	3.27767	0.03051
	0.7042	0.0063	355.4368	1155.60	3.25121	0.03076
	0.7032	0.0073	356.5924	1149.90	3.22469	0.03101
	0.7022	0.0083	357.7423	1144.30	3.19867	0.03126
	0.7012	0.0093	358.8866	1138.70	3.17287	0.03152
	0.7002	0.0103	360.0253			
					δx_i avg. =	0.030
270 K	0.7102	0.0003	330.3381	1250.60	3.78582	0.02641
	0.7092	0.0013	331.5887	1248.10	3.76400	0.02657
	0.7082	0.0023	332.8368	1245.70	3.74268	0.02672
	0.7072	0.0033	334.0825	1243.20	3.72124	0.02687
	0.7062	0.0043	335.3257	1240.50	3.69939	0.02703
	0.7052	0.0053	336.5662	1237.80	3.67773	0.02719
	0.7042	0.0063	337.8040	1235.10	3.65626	0.02735
	0.7032	0.0073	339.0391	1232.20	3.63439	0.02751
	0.7022	0.0083	340.2713	1229.40	3.61300	0.02768
	0.7012	0.0093	341.5007	1226.40	3.59121	0.02785
	0.7002	0.0103	342.7271			
					δx_i avg. =	0.027
290 K	0.7102	0.0003	293.3623	1281.70	4.36900	0.02289
	0.7092	0.0013	294.6440	1283.70	4.35678	0.02295
	0.7082	0.0023	295.9277	1285.60	4.34430	0.02302
	0.7072	0.0033	297.2133	1287.30	4.33123	0.02309
	0.7062	0.0043	298.5006	1289.00	4.31825	0.02316
	0.7052	0.0053	299.7896	1290.60	4.30502	0.02323

Table A.2.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	301.0802	1292.10	4.29155	0.02330
	0.7032	0.0073	302.3723	1293.60	4.27817	0.02337
	0.7022	0.0083	303.6659	1294.90	4.26423	0.02345
	0.7012	0.0093	304.9608	1296.20	4.25038	0.02353
	0.7002	0.0103	306.2570			
					δx_i avg. =	0.023
310 K	0.7102	0.0003	258.2901	1226.10	4.74699	0.02107
	0.7092	0.0013	259.5162	1229.60	4.73805	0.02111
	0.7082	0.0023	260.7458	1233.30	4.72989	0.02114
	0.7072	0.0033	261.9791	1236.70	4.72061	0.02118
	0.7062	0.0043	263.2158	1240.20	4.71172	0.02122
	0.7052	0.0053	264.4560	1243.60	4.70248	0.02127
	0.7042	0.0063	265.6996	1246.90	4.69289	0.02131
	0.7032	0.0073	266.9465	1250.20	4.68334	0.02135
	0.7022	0.0083	268.1967	1253.50	4.67381	0.02140
	0.7012	0.0093	269.4502	1256.70	4.66394	0.02144
	0.7002	0.0103	270.7069			
					δx_i avg. =	0.021
330 K	0.7102	0.0003	227.6089	1118.80	4.91545	0.02034
	0.7092	0.0013	228.7277	1122.90	4.90933	0.02037
	0.7082	0.0023	229.8506	1126.90	4.90275	0.02040
	0.7072	0.0033	230.9775	1131.10	4.89701	0.02042
	0.7062	0.0043	232.1086	1135.00	4.88995	0.02045
	0.7052	0.0053	233.2436	1139.10	4.88374	0.02048
	0.7042	0.0063	234.3827	1143.10	4.87707	0.02050
	0.7032	0.0073	235.5258	1147.10	4.87038	0.02053
	0.7022	0.0083	236.6729	1151.00	4.86325	0.02056
	0.7012	0.0093	237.8239	1154.90	4.85611	0.02059
	0.7002	0.0103	238.9788			
					δx_i avg. =	0.020

Table A.2.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	202.2615	991.30	4.90108	0.02040
	0.7092	0.0013	203.2528	995.20	4.89637	0.02042
	0.7082	0.0023	204.2480	999.00	4.89111	0.02045
	0.7072	0.0033	205.2470	1002.90	4.88631	0.02047
	0.7062	0.0043	206.2499	1006.70	4.88097	0.02049
	0.7052	0.0053	207.2566	1010.50	4.87560	0.02051
	0.7042	0.0063	208.2671	1014.40	4.87067	0.02053
	0.7032	0.0073	209.2815	1018.20	4.86522	0.02055
	0.7022	0.0083	210.2997	1022.00	4.85973	0.02058
	0.7012	0.0093	211.3217	1025.90	4.85468	0.02060
	0.7002	0.0103	212.3476			
					δx_i avg. =	0.020

Table A.2.3. SonicWare® Calculations for the Case B Gas Mixture at 24.132 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260K	0.7102	0.0003	361.1848	1145.50	3.17151	0.03153
	0.7092	0.0013	362.3303	1140.30	3.14713	0.03177
	0.7082	0.0023	363.4706	1135.20	3.12322	0.03202
	0.7072	0.0033	364.6058	1129.90	3.09896	0.03227
	0.7062	0.0043	365.7357	1124.80	3.07544	0.03252
	0.7052	0.0053	366.8605	1119.60	3.05184	0.03277
	0.7042	0.0063	367.9801	1114.40	3.02842	0.03302
	0.7032	0.0073	369.0945	1109.30	3.00546	0.03327
	0.7022	0.0083	370.2038	1104.20	2.98268	0.03353
	0.7012	0.0093	371.3080	1099.10	2.96008	0.03378
	0.7002	0.0103	372.4071			
					δx_i avg. =	0.033
270 K	0.7102	0.0003	345.3164	1195.20	3.46117	0.02889
	0.7092	0.0013	346.5116	1192.60	3.44173	0.02906
	0.7082	0.0023	347.7042	1189.80	3.42187	0.02922
	0.7072	0.0033	348.8940	1187.10	3.40247	0.02939
	0.7062	0.0043	350.0811	1184.40	3.38322	0.02956
	0.7052	0.0053	351.2655	1181.50	3.36355	0.02973
	0.7042	0.0063	352.4470	1178.60	3.34405	0.02990
	0.7032	0.0073	353.6256	1175.70	3.32470	0.03008
	0.7022	0.0083	354.8013	1172.70	3.30523	0.03026
	0.7012	0.0093	355.9740	1169.80	3.28620	0.03043
	0.7002	0.0103	357.1438			
					δx_i avg. =	0.030
290 K	0.7102	0.0003	312.8282	1227.50	3.92388	0.02548
	0.7092	0.0013	314.0557	1228.30	3.91109	0.02557
	0.7082	0.0023	315.2840	1229.20	3.89871	0.02565
	0.7072	0.0033	316.5132	1229.90	3.88578	0.02573
	0.7062	0.0043	317.7431	1230.60	3.87294	0.02582
	0.7052	0.0053	318.9737	1231.20	3.85988	0.02591

Table A.2.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	320.2049	1231.60	3.84629	0.02600
	0.7032	0.0073	321.4365	1232.10	3.83311	0.02609
	0.7022	0.0083	322.6686	1232.40	3.81940	0.02618
	0.7012	0.0093	323.9010	1232.60	3.80548	0.02628
	0.7002	0.0103	325.1336			
					δx_i avg. =	0.026
310 K	0.7102	0.0003	281.3265	1193.60	4.24276	0.02357
	0.7092	0.0013	282.5201	1196.00	4.23333	0.02362
	0.7082	0.0023	283.7161	1198.40	4.22394	0.02367
	0.7072	0.0033	284.9145	1200.90	4.21495	0.02373
	0.7062	0.0043	286.1154	1203.10	4.20495	0.02378
	0.7052	0.0053	287.3185	1205.50	4.19569	0.02383
	0.7042	0.0063	288.5240	1207.60	4.18544	0.02389
	0.7032	0.0073	289.7316	1209.80	4.17559	0.02395
	0.7022	0.0083	290.9414	1211.90	4.16544	0.02401
	0.7012	0.0093	292.1533	1213.90	4.15501	0.02407
	0.7002	0.0103	293.3672			
					δx_i avg. =	0.024
330 K	0.7102	0.0003	252.5993	1121.60	4.44023	0.02252
	0.7092	0.0013	253.7209	1124.60	4.43243	0.02256
	0.7082	0.0023	254.8455	1127.50	4.42425	0.02260
	0.7072	0.0033	255.9730	1130.50	4.41648	0.02264
	0.7062	0.0043	257.1035	1133.30	4.40795	0.02269
	0.7052	0.0053	258.2368	1136.10	4.39945	0.02273
	0.7042	0.0063	259.3729	1138.90	4.39098	0.02277
	0.7032	0.0073	260.5118	1141.70	4.38253	0.02282
	0.7022	0.0083	261.6535	1144.50	4.37411	0.02286
	0.7012	0.0093	262.7980	1147.10	4.36495	0.02291
	0.7002	0.0103	263.9451			
					δx_i avg. =	0.023

Table A.2.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	227.5811	1028.40	4.51883	0.02213
	0.7092	0.0013	228.6095	1031.40	4.51162	0.02216
	0.7082	0.0023	229.6409	1034.40	4.50442	0.02220
	0.7072	0.0033	230.6753	1037.30	4.49680	0.02224
	0.7062	0.0043	231.7126	1040.20	4.48918	0.02228
	0.7052	0.0053	232.7528	1043.20	4.48201	0.02231
	0.7042	0.0063	233.7960	1046.10	4.47441	0.02235
	0.7032	0.0073	234.8421	1049.00	4.46683	0.02239
	0.7022	0.0083	235.8911	1051.90	4.45926	0.02243
	0.7012	0.0093	236.9430	1054.70	4.45128	0.02247
	0.7002	0.0103	237.9977			
					δx_i avg. =	0.022

Table A.2.4. SonicWare® Calculations for the Case B Gas Mixture at 27.579 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	371.6508	1115.00	3.00013	0.03333
	0.7092	0.0013	372.7658	1110.20	2.97828	0.03358
	0.7082	0.0023	373.8760	1105.30	2.95633	0.03383
	0.7072	0.0033	374.9813	1100.50	2.93481	0.03407
	0.7062	0.0043	376.0818	1095.80	2.91373	0.03432
	0.7052	0.0053	377.1776	1090.90	2.89227	0.03457
	0.7042	0.0063	378.2685	1086.20	2.87151	0.03482
	0.7032	0.0073	379.3547	1081.40	2.85063	0.03508
	0.7022	0.0083	380.4361	1076.70	2.83017	0.03533
	0.7012	0.0093	381.5128	1071.90	2.80960	0.03559
	0.7002	0.0103	382.5847			
					δx_i avg. =	0.034
270 K	0.7102	0.0003	357.3060	1156.20	3.23588	0.03090
	0.7092	0.0013	358.4622	1153.60	3.21819	0.03107
	0.7082	0.0023	359.6158	1150.70	3.19980	0.03125
	0.7072	0.0033	360.7665	1148.00	3.18211	0.03143
	0.7062	0.0043	361.9145	1145.20	3.16428	0.03160
	0.7052	0.0053	363.0597	1142.30	3.14631	0.03178
	0.7042	0.0063	364.2020	1139.40	3.12848	0.03196
	0.7032	0.0073	365.3414	1136.60	3.11106	0.03214
	0.7022	0.0083	366.4780	1133.60	3.09323	0.03233
	0.7012	0.0093	367.6116	1130.70	3.07580	0.03251
	0.7002	0.0103	368.7423			
					δx_i avg. =	0.032
290 K	0.7102	0.0003	328.0405	1185.90	3.61510	0.02766
	0.7092	0.0013	329.2264	1186.00	3.60238	0.02776
	0.7082	0.0023	330.4124	1186.20	3.59006	0.02785
	0.7072	0.0033	331.5986	1186.20	3.57722	0.02795
	0.7062	0.0043	332.7848	1186.10	3.56417	0.02806
	0.7052	0.0053	333.9709	1186.10	3.55151	0.02816

Table A.2.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	335.1570	1185.90	3.53834	0.02826
	0.7032	0.0073	336.3429	1185.70	3.52527	0.02837
	0.7022	0.0083	337.5286	1185.40	3.51200	0.02847
	0.7012	0.0093	338.7140	1184.90	3.49823	0.02859
	0.7002	0.0103	339.8989			
					δx_i avg. =	0.028
310 K	0.7102	0.0003	299.3801	1163.50	3.88636	0.02573
	0.7092	0.0013	300.5436	1165.30	3.87731	0.02579
	0.7082	0.0023	301.7089	1166.80	3.86730	0.02586
	0.7072	0.0033	302.8757	1168.40	3.85769	0.02592
	0.7062	0.0043	304.0441	1169.90	3.84780	0.02599
	0.7052	0.0053	305.2140	1171.30	3.83764	0.02606
	0.7042	0.0063	306.3853	1172.60	3.82721	0.02613
	0.7032	0.0073	307.5579	1174.00	3.81717	0.02620
	0.7022	0.0083	308.7319	1175.10	3.80622	0.02627
	0.7012	0.0093	309.9070	1176.40	3.79598	0.02634
	0.7002	0.0103	311.0834			
					δx_i avg. =	0.026
330 K	0.7102	0.0003	272.6465	1110.80	4.07414	0.02455
	0.7092	0.0013	273.7573	1113.00	4.06565	0.02460
	0.7082	0.0023	274.8703	1115.10	4.05682	0.02465
	0.7072	0.0033	275.9854	1117.10	4.04768	0.02471
	0.7062	0.0043	277.1025	1119.20	4.03894	0.02476
	0.7052	0.0053	278.2217	1121.20	4.02988	0.02481
	0.7042	0.0063	279.3429	1123.10	4.02051	0.02487
	0.7032	0.0073	280.4660	1125.00	4.01118	0.02493
	0.7022	0.0083	281.5910	1126.90	4.00190	0.02499
	0.7012	0.0093	282.7179	1128.70	3.99232	0.02505
	0.7002	0.0103	283.8466			
					δx_i avg. =	0.025

Table A.2.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	248.6077	1040.80	4.18652	0.02389
	0.7092	0.0013	249.6485	1043.20	4.17868	0.02393
	0.7082	0.0023	250.6917	1045.30	4.16966	0.02398
	0.7072	0.0033	251.7370	1047.50	4.16109	0.02403
	0.7062	0.0043	252.7845	1049.70	4.15255	0.02408
	0.7052	0.0053	253.8342	1051.80	4.14365	0.02413
	0.7042	0.0063	254.8860	1053.90	4.13479	0.02419
	0.7032	0.0073	255.9399	1056.00	4.12597	0.02424
	0.7022	0.0083	256.9959	1058.10	4.11719	0.02429
	0.7012	0.0093	258.0540	1060.10	4.10805	0.02434
	0.7002	0.0103	259.1141			
					δx_i avg. =	0.024

Table A.2.5. SonicWare® Calculations for the Case B Gas Mixture at 31.026 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	380.5511	1092.60	2.87110	0.03483
	0.7092	0.0013	381.6437	1088.10	2.85109	0.03507
	0.7082	0.0023	382.7318	1083.60	2.83123	0.03532
	0.7072	0.0033	383.8154	1079.00	2.81125	0.03557
	0.7062	0.0043	384.8944	1074.50	2.79167	0.03582
	0.7052	0.0053	385.9689	1070.00	2.77224	0.03607
	0.7042	0.0063	387.0389	1065.60	2.75321	0.03632
	0.7032	0.0073	388.1045	1061.10	2.73406	0.03658
	0.7022	0.0083	389.1656	1056.70	2.71530	0.03683
	0.7012	0.0093	390.2223	1052.40	2.69692	0.03708
	0.7002	0.0103	391.2747			
					δx_i avg. =	0.036
270 K	0.7102	0.0003	367.3433	1127.50	3.06934	0.03258
	0.7092	0.0013	368.4708	1124.80	3.05262	0.03276
	0.7082	0.0023	369.5956	1122.00	3.03575	0.03294
	0.7072	0.0033	370.7176	1119.30	3.01928	0.03312
	0.7062	0.0043	371.8369	1116.40	3.00239	0.03331
	0.7052	0.0053	372.9533	1113.70	2.98616	0.03349
	0.7042	0.0063	374.0670	1110.70	2.96925	0.03368
	0.7032	0.0073	375.1777	1108.00	2.95327	0.03386
	0.7022	0.0083	376.2857	1105.10	2.93686	0.03405
	0.7012	0.0093	377.3908	1102.20	2.92058	0.03424
	0.7002	0.0103	378.4930			
					δx_i avg. =	0.033
290 K	0.7102	0.0003	340.5030	1153.60	3.38793	0.02952
	0.7092	0.0013	341.6566	1153.30	3.37561	0.02962
	0.7082	0.0023	342.8099	1153.00	3.36338	0.02973
	0.7072	0.0033	343.9629	1152.50	3.35065	0.02984
	0.7062	0.0043	345.1154	1152.10	3.33830	0.02996
	0.7052	0.0053	346.2675	1151.50	3.32546	0.03007

Table A.2.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	347.4190	1150.90	3.31271	0.03019
	0.7032	0.0073	348.5699	1150.30	3.30006	0.03030
	0.7022	0.0083	349.7202	1149.50	3.28691	0.03042
	0.7012	0.0093	350.8697	1148.80	3.27415	0.03054
	0.7002	0.0103	352.0185			
					δx_i avg. =	0.030
310 K	0.7102	0.0003	314.1005	1137.90	3.62273	0.02760
	0.7092	0.0013	315.2384	1139.00	3.61314	0.02768
	0.7082	0.0023	316.3774	1140.00	3.60329	0.02775
	0.7072	0.0033	317.5174	1140.80	3.59287	0.02783
	0.7062	0.0043	318.6582	1141.70	3.58284	0.02791
	0.7052	0.0053	319.7999	1142.40	3.57223	0.02799
	0.7042	0.0063	320.9423	1143.20	3.56201	0.02807
	0.7032	0.0073	322.0855	1143.90	3.55154	0.02816
	0.7022	0.0083	323.2294	1144.40	3.54052	0.02824
	0.7012	0.0093	324.3738	1145.00	3.52988	0.02833
	0.7002	0.0103	325.5188			
					δx_i avg. =	0.028
330 K	0.7102	0.0003	289.1371	1097.00	3.79405	0.02636
	0.7092	0.0013	290.2341	1098.50	3.78488	0.02642
	0.7082	0.0023	291.3326	1100.00	3.77575	0.02648
	0.7072	0.0033	292.4326	1101.40	3.76634	0.02655
	0.7062	0.0043	293.5340	1102.80	3.75698	0.02662
	0.7052	0.0053	294.6368	1104.20	3.74766	0.02668
	0.7042	0.0063	295.7410	1105.40	3.73773	0.02675
	0.7032	0.0073	296.8464	1106.70	3.72819	0.02682
	0.7022	0.0083	297.9531	1108.00	3.71871	0.02689
	0.7012	0.0093	299.0611	1109.10	3.70861	0.02696
	0.7002	0.0103	300.1702			
					δx_i avg. =	0.027

Table A.2.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	266.2397	1041.90	3.91339	0.02555
	0.7092	0.0013	267.2816	1043.60	3.90450	0.02561
	0.7082	0.0023	268.3252	1045.10	3.89490	0.02567
	0.7072	0.0033	269.3703	1046.70	3.88573	0.02574
	0.7062	0.0043	270.4170	1048.30	3.87661	0.02580
	0.7052	0.0053	271.4653	1049.80	3.86716	0.02586
	0.7042	0.0063	272.5151	1051.20	3.85740	0.02592
	0.7032	0.0073	273.5663	1052.70	3.84806	0.02599
	0.7022	0.0083	274.6190	1054.10	3.83841	0.02605
	0.7012	0.0093	275.6731	1055.50	3.82881	0.02612
	0.7002	0.0103	276.7286			
					δx_i avg. =	0.026

Table A.2.6. SonicWare® Calculations for the Case B Gas Mixture at 34.474 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	388.3247	1075.50	2.76959	0.03611
	0.7092	0.0013	389.4002	1071.20	2.75090	0.03635
	0.7082	0.0023	390.4714	1066.90	2.73234	0.03660
	0.7072	0.0033	391.5383	1062.60	2.71391	0.03685
	0.7062	0.0043	392.6009	1058.40	2.69587	0.03709
	0.7052	0.0053	393.6593	1054.10	2.67770	0.03735
	0.7042	0.0063	394.7134	1050.00	2.66016	0.03759
	0.7032	0.0073	395.7634	1045.70	2.64224	0.03785
	0.7022	0.0083	396.8091	1041.60	2.62494	0.03810
	0.7012	0.0093	397.8507	1037.50	2.60776	0.03835
	0.7002	0.0103	398.8882			
					δx_i avg. =	0.037
270 K	0.7102	0.0003	376.0054	1105.50	2.94012	0.03401
	0.7092	0.0013	377.1109	1102.70	2.92407	0.03420
	0.7082	0.0023	378.2136	1100.00	2.90841	0.03438
	0.7072	0.0033	379.3136	1097.30	2.89286	0.03457
	0.7062	0.0043	380.4109	1094.50	2.87715	0.03476
	0.7052	0.0053	381.5054	1091.80	2.86182	0.03494
	0.7042	0.0063	382.5972	1089.00	2.84634	0.03513
	0.7032	0.0073	383.6862	1086.20	2.83096	0.03532
	0.7022	0.0083	384.7724	1083.40	2.81569	0.03552
	0.7012	0.0093	385.8558	1080.60	2.80053	0.03571
	0.7002	0.0103	386.9364			
					δx_i avg. =	0.035
290 K	0.7102	0.0003	351.0625	1128.20	3.21367	0.03112
	0.7092	0.0013	352.1907	1127.50	3.20139	0.03124
	0.7082	0.0023	353.3182	1126.80	3.18919	0.03136
	0.7072	0.0033	354.4450	1126.10	3.17708	0.03148
	0.7062	0.0043	355.5711	1125.30	3.16477	0.03160
	0.7052	0.0053	356.6964	1124.50	3.15254	0.03172

Table A.2.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	357.8209	1123.60	3.14012	0.03185
	0.7032	0.0073	358.9445	1122.60	3.12750	0.03197
	0.7022	0.0083	360.0671	1121.70	3.11525	0.03210
	0.7012	0.0093	361.1888	1120.70	3.10281	0.03223
	0.7002	0.0103	362.3095			
					δx_i avg. =	0.032
310 K	0.7102	0.0003	326.4824	1116.40	3.41948	0.02924
	0.7092	0.0013	327.5988	1116.90	3.40935	0.02933
	0.7082	0.0023	328.7157	1117.40	3.39929	0.02942
	0.7072	0.0033	329.8331	1117.70	3.38868	0.02951
	0.7062	0.0043	330.9508	1118.20	3.37875	0.02960
	0.7052	0.0053	332.0690	1118.40	3.36797	0.02969
	0.7042	0.0063	333.1874	1118.60	3.35727	0.02979
	0.7032	0.0073	334.3060	1118.80	3.34663	0.02988
	0.7022	0.0083	335.4248	1119.00	3.33607	0.02998
	0.7012	0.0093	336.5438	1119.00	3.32498	0.03008
	0.7002	0.0103	337.6628			
					δx_i avg. =	0.030
330 K	0.7102	0.0003	303.0414	1083.40	3.57509	0.02797
	0.7092	0.0013	304.1248	1084.30	3.56531	0.02805
	0.7082	0.0023	305.2091	1085.30	3.55592	0.02812
	0.7072	0.0033	306.2944	1086.30	3.54659	0.02820
	0.7062	0.0043	307.3807	1087.10	3.53666	0.02828
	0.7052	0.0053	308.4678	1087.90	3.52679	0.02835
	0.7042	0.0063	309.5557	1088.70	3.51698	0.02843
	0.7032	0.0073	310.6444	1089.50	3.50723	0.02851
	0.7022	0.0083	311.7339	1090.20	3.49721	0.02859
	0.7012	0.0093	312.8241	1090.90	3.48726	0.02868
	0.7002	0.0103	313.9150			
					δx_i avg. =	0.028

Table A.2.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	281.2551	1038.20	3.69131	0.02709
	0.7092	0.0013	282.2933	1039.30	3.68163	0.02716
	0.7082	0.0023	283.3326	1040.50	3.67236	0.02723
	0.7072	0.0033	284.3731	1041.50	3.66244	0.02730
	0.7062	0.0043	285.4146	1042.60	3.65293	0.02738
	0.7052	0.0053	286.4572	1043.60	3.64313	0.02745
	0.7042	0.0063	287.5008	1044.60	3.63338	0.02752
	0.7032	0.0073	288.5454	1045.60	3.62369	0.02760
	0.7022	0.0083	289.5910	1046.50	3.61372	0.02767
	0.7012	0.0093	290.6375	1047.30	3.60346	0.02775
	0.7002	0.0103	291.6848			
					δx_i avg. =	0.027

Table A.2.7. SonicWare® Calculations for the Case B Gas Mixture at 37.921 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
260 K	0.7102	0.0003	395.2462	1062.00	2.68693	0.03722
	0.7092	0.0013	396.3082	1057.90	2.66939	0.03746
	0.7082	0.0023	397.3661	1053.80	2.65196	0.03771
	0.7072	0.0033	398.4199	1049.80	2.63491	0.03795
	0.7062	0.0043	399.4697	1045.70	2.61772	0.03820
	0.7052	0.0053	400.5154	1041.70	2.60090	0.03845
	0.7042	0.0063	401.5571	1037.70	2.58419	0.03870
	0.7032	0.0073	402.5948	1033.70	2.56759	0.03895
	0.7022	0.0083	403.6285	1029.80	2.55136	0.03919
	0.7012	0.0093	404.6583	1025.90	2.53523	0.03944
	0.7002	0.0103	405.6842			
					δx_i avg. =	0.038
270 K	0.7102	0.0003	383.6453	1088.00	2.83595	0.03526
	0.7092	0.0013	384.7333	1085.40	2.82118	0.03545
	0.7082	0.0023	385.8187	1082.60	2.80598	0.03564
	0.7072	0.0033	386.9013	1080.00	2.79141	0.03582
	0.7062	0.0043	387.9813	1077.30	2.77668	0.03601
	0.7052	0.0053	389.0586	1074.50	2.76179	0.03621
	0.7042	0.0063	390.1331	1071.90	2.74752	0.03640
	0.7032	0.0073	391.2050	1069.10	2.73284	0.03659
	0.7022	0.0083	392.2741	1066.40	2.71851	0.03678
	0.7012	0.0093	393.3405	1063.70	2.70427	0.03698
	0.7002	0.0103	394.4042			
					δx_i avg. =	0.036
290 K	0.7102	0.0003	360.2340	1107.70	3.07495	0.03252
	0.7092	0.0013	361.3417	1106.80	3.06303	0.03265
	0.7082	0.0023	362.4485	1105.80	3.05092	0.03278
	0.7072	0.0033	363.5543	1105.00	3.03944	0.03290
	0.7062	0.0043	364.6593	1103.90	3.02721	0.03303
	0.7052	0.0053	365.7632	1102.80	3.01507	0.03317

Table A.2.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.7042	0.0063	366.8660	1101.80	3.00328	0.03330
	0.7032	0.0073	367.9678	1100.60	2.99102	0.03343
	0.7022	0.0083	369.0684	1099.50	2.97912	0.03357
	0.7012	0.0093	370.1679	1098.30	2.96703	0.03370
	0.7002	0.0103	371.2662			
					δx_i avg. =	0.033
310 K	0.7102	0.0003	337.1521	1098.30	3.25758	0.03070
	0.7092	0.0013	338.2504	1098.30	3.24700	0.03080
	0.7082	0.0023	339.3487	1098.50	3.23708	0.03089
	0.7072	0.0033	340.4472	1098.40	3.22634	0.03099
	0.7062	0.0043	341.5456	1098.40	3.21597	0.03109
	0.7052	0.0053	342.6440	1098.40	3.20566	0.03119
	0.7042	0.0063	343.7424	1098.20	3.19483	0.03130
	0.7032	0.0073	344.8406	1098.00	3.18408	0.03141
	0.7022	0.0083	345.9386	1097.90	3.17368	0.03151
	0.7012	0.0093	347.0365	1097.50	3.16249	0.03162
	0.7002	0.0103	348.1340			
					δx_i avg. =	0.031
330 K	0.7102	0.0003	315.0153	1070.80	3.39920	0.02942
	0.7092	0.0013	316.0861	1071.30	3.38927	0.02950
	0.7082	0.0023	317.1574	1071.90	3.37971	0.02959
	0.7072	0.0033	318.2293	1072.40	3.36990	0.02967
	0.7062	0.0043	319.3017	1072.80	3.35983	0.02976
	0.7052	0.0053	320.3745	1073.30	3.35014	0.02985
	0.7042	0.0063	321.4478	1073.60	3.33989	0.02994
	0.7032	0.0073	322.5214	1074.00	3.33001	0.03003
	0.7022	0.0083	323.5954	1074.30	3.31989	0.03012
	0.7012	0.0093	324.6697	1074.60	3.30983	0.03021
	0.7002	0.0103	325.7443			
					δx_i avg. =	0.030

Table A.2.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.7102	0.0003	294.2498	1032.70	3.50960	0.02849
	0.7092	0.0013	295.2825	1033.40	3.49970	0.02857
	0.7082	0.0023	296.3159	1034.20	3.49019	0.02865
	0.7072	0.0033	297.3501	1034.90	3.48041	0.02873
	0.7062	0.0043	298.3850	1035.50	3.47035	0.02882
	0.7052	0.0053	299.4205	1036.10	3.46035	0.02890
	0.7042	0.0063	300.4566	1036.70	3.45042	0.02898
	0.7032	0.0073	301.4933	1037.30	3.44054	0.02907
	0.7022	0.0083	302.5306	1037.80	3.43040	0.02915
	0.7012	0.0093	303.5684	1038.30	3.42032	0.02924
	0.7002	0.0103	304.6067			
					δx_i avg. =	0.029

Table A.3. SonicWare® Calculations for the Case C Gas Mixture at 13.79 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	221.6818	838.70	3.78335	0.02643
	0.8913	0.001	222.5205	831.10	3.73494	0.02677
	0.8903	0.002	223.3516	822.90	3.68433	0.02714
	0.8893	0.003	224.1745	814.20	3.63199	0.02753
	0.8883	0.004	224.9887	804.60	3.57618	0.02796
	0.8873	0.005	225.7933	794.50	3.51870	0.02842
	0.8863	0.006	226.5878	783.70	3.45870	0.02891
	0.8853	0.007	227.3715	772.40	3.39708	0.02944
	0.8843	0.008	228.1439	760.40	3.33298	0.03000
	0.8833	0.009	228.9043	747.80	3.26687	0.03061
	0.8823	0.01	229.6521			
					δx_i avg. =	0.028
270 K	0.8923	0	175.5316	959.70	5.46739	0.01829
	0.8913	0.001	176.4913	964.60	5.46543	0.01830
	0.8903	0.002	177.4559	969.30	5.46220	0.01831
	0.8893	0.003	178.4252	973.50	5.45607	0.01833
	0.8883	0.004	179.3987	977.60	5.44931	0.01835
	0.8873	0.005	180.3763	981.30	5.44029	0.01838
	0.8863	0.006	181.3576	985.00	5.43126	0.01841
	0.8853	0.007	182.3426	988.20	5.41947	0.01845
	0.8843	0.008	183.3308	991.40	5.40771	0.01849
	0.8833	0.009	184.3222	994.30	5.39436	0.01854
	0.8823	0.01	185.3165			
					δx_i avg. =	0.018
290 K	0.8923	0	144.7467	854.30	5.90203	0.01694
	0.8913	0.001	145.6010	860.80	5.91205	0.01691
	0.8903	0.002	146.4618	867.10	5.92032	0.01689
	0.8893	0.003	147.3289	873.40	5.92823	0.01687
	0.8883	0.004	148.2023	879.60	5.93513	0.01685
	0.8873	0.005	149.0819	885.70	5.94103	0.01683

Table A.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8863	0.006	149.9676	891.70	5.94595	0.01682
	0.8853	0.007	150.8593	897.70	5.95058	0.01681
	0.8843	0.008	151.7570	903.70	5.95491	0.01679
	0.8833	0.009	152.6607	909.50	5.95766	0.01679
	0.8823	0.01	153.5702			
					δx_i avg. =	0.017
310 K	0.8923	0	124.3600	720.70	5.79527	0.01726
	0.8913	0.001	125.0807	725.70	5.80185	0.01724
	0.8903	0.002	125.8064	730.70	5.80813	0.01722
	0.8893	0.003	126.5371	735.70	5.81411	0.01720
	0.8883	0.004	127.2728	740.70	5.81978	0.01718
	0.8873	0.005	128.0135	745.70	5.82517	0.01717
	0.8863	0.006	128.7592	750.70	5.83026	0.01715
	0.8853	0.007	129.5099	755.70	5.83508	0.01714
	0.8843	0.008	130.2656	760.70	5.83961	0.01712
	0.8833	0.009	131.0263	765.80	5.84463	0.01711
	0.8823	0.01	131.7921			
					δx_i avg. =	0.017
330 K	0.8923	0	110.0038	615.30	5.59344	0.01788
	0.8913	0.001	110.6191	618.70	5.59307	0.01788
	0.8903	0.002	111.2378	622.20	5.59342	0.01788
	0.8893	0.003	111.8600	625.80	5.59449	0.01787
	0.8883	0.004	112.4858	629.20	5.59359	0.01788
	0.8873	0.005	113.1150	632.80	5.59431	0.01788
	0.8863	0.006	113.7478	636.40	5.59483	0.01787
	0.8853	0.007	114.3842	639.90	5.59430	0.01788
	0.8843	0.008	115.0241	643.60	5.59535	0.01787
	0.8833	0.009	115.6677	647.10	5.59447	0.01787
	0.8823	0.01	116.3148			
					δx_i avg. =	0.018

Table A.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	99.2710	536.80	5.40742	0.01849
	0.8913	0.001	99.8078	539.20	5.40238	0.01851
	0.8903	0.002	100.3470	541.70	5.39827	0.01852
	0.8893	0.003	100.8887	544.10	5.39307	0.01854
	0.8883	0.004	101.4328	546.50	5.38780	0.01856
	0.8873	0.005	101.9793	549.00	5.38345	0.01858
	0.8863	0.006	102.5283	551.40	5.37803	0.01859
	0.8853	0.007	103.0797	554.00	5.37448	0.01861
	0.8843	0.008	103.6337	556.40	5.36891	0.01863
	0.8833	0.009	104.1901	559.00	5.36519	0.01864
	0.8823	0.01	104.7491			
					δx_i avg. =	0.019

Table A.3.1. SonicWare® Calculations for the Case C Gas Mixture at 17.237 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	256.6352	882.40	3.43834	0.02908
	0.8933	0.001	257.5176	877.40	3.40715	0.02935
	0.8943	0.002	258.3950	872.00	3.37468	0.02963
	0.8953	0.003	259.2670	865.90	3.33980	0.02994
	0.8963	0.004	260.1329	859.50	3.30408	0.03027
	0.8973	0.005	260.9924	852.50	3.26638	0.03061
	0.8983	0.006	261.8449	845.10	3.22748	0.03098
	0.8993	0.007	262.6900	837.40	3.18779	0.03137
	0.9003	0.008	263.5274	829.10	3.14616	0.03178
	0.9013	0.009	264.3565	820.50	3.10376	0.03222
	0.9023	0.01	265.1770			
					δx_i avg. =	0.031
270 K	0.8923	0	214.8715	970.60	4.51712	0.02214
	0.8933	0.001	215.8421	975.80	4.52090	0.02212
	0.8943	0.002	216.8179	980.50	4.52223	0.02211
	0.8953	0.003	217.7984	984.90	4.52207	0.02211
	0.8963	0.004	218.7833	989.00	4.52045	0.02212
	0.8973	0.005	219.7723	992.90	4.51786	0.02213
	0.8983	0.006	220.7652	996.50	4.51385	0.02215
	0.8993	0.007	221.7617	999.80	4.50844	0.02218
	0.9003	0.008	222.7615	1003.00	4.50257	0.02221
	0.9013	0.009	223.7645	1005.90	4.49535	0.02225
	0.9023	0.01	224.7704			
					δx_i avg. =	0.022
290 K	0.8923	0	181.3751	942.90	5.19862	0.01924
	0.8933	0.001	182.3180	949.40	5.20738	0.01920
	0.8943	0.002	183.2674	955.70	5.21478	0.01918
	0.8953	0.003	184.2231	962.00	5.22193	0.01915
	0.8963	0.004	185.1851	968.00	5.22720	0.01913
	0.8973	0.005	186.1531	973.90	5.23172	0.01911

Table A.3.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8983	0.006	187.1270	979.70	5.23548	0.01910
	0.8993	0.007	188.1067	985.40	5.23852	0.01909
	0.9003	0.008	189.0921	991.00	5.24083	0.01908
	0.9013	0.009	190.0831	996.40	5.24192	0.01908
	0.9023	0.01	191.0795			
					δx_i avg. =	0.019
310 K	0.8923	0	156.6573	847.40	5.40926	0.01849
	0.8933	0.001	157.5047	853.00	5.41571	0.01846
	0.8943	0.002	158.3577	858.50	5.42127	0.01845
	0.8953	0.003	159.2162	864.00	5.42658	0.01843
	0.8963	0.004	160.0802	869.50	5.43165	0.01841
	0.8973	0.005	160.9497	874.80	5.43524	0.01840
	0.8983	0.006	161.8245	880.20	5.43923	0.01838
	0.8993	0.007	162.7047	885.50	5.44238	0.01837
	0.9003	0.008	163.5902	890.80	5.44531	0.01836
	0.9013	0.009	164.4810	896.00	5.44744	0.01836
	0.9023	0.01	165.3770			
					δx_i avg. =	0.018
330 K	0.8923	0	138.4499	746.10	5.38895	0.01856
	0.8933	0.001	139.1960	750.30	5.39024	0.01855
	0.8943	0.002	139.9463	754.50	5.39135	0.01855
	0.8953	0.003	140.7008	758.70	5.39229	0.01854
	0.8963	0.004	141.4595	762.90	5.39306	0.01854
	0.8973	0.005	142.2224	767.10	5.39367	0.01854
	0.8983	0.006	142.9895	771.30	5.39410	0.01854
	0.8993	0.007	143.7608	775.50	5.39438	0.01854
	0.9003	0.008	144.5363	779.70	5.39449	0.01854
	0.9013	0.009	145.3160	783.80	5.39376	0.01854
	0.9023	0.01	146.0998			
					δx_i avg. =	0.019

Table A.3.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	124.6337	659.90	5.29472	0.01889
	0.8933	0.001	125.2936	663.10	5.29237	0.01890
	0.8943	0.002	125.9567	666.10	5.28833	0.01891
	0.8953	0.003	126.6228	669.10	5.28420	0.01892
	0.8963	0.004	127.2919	672.30	5.28156	0.01893
	0.8973	0.005	127.9642	675.30	5.27726	0.01895
	0.8983	0.006	128.6395	678.30	5.27287	0.01896
	0.8993	0.007	129.3178	681.50	5.26996	0.01898
	0.9003	0.008	129.9993	684.60	5.26618	0.01899
	0.9013	0.009	130.6839	687.60	5.26155	0.01901
	0.9023	0.01	131.3715			
					δx_i avg. =	0.019

Table A.3.2. SonicWare® Calculations for the Case C Gas Mixture at 20.684 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	279.7358	934.60	3.34101	0.02993
	0.8933	0.001	280.6704	931.00	3.31706	0.03015
	0.8943	0.002	281.6014	926.90	3.29153	0.03038
	0.8953	0.003	282.5283	922.40	3.26481	0.03063
	0.8963	0.004	283.4507	917.50	3.23689	0.03089
	0.8973	0.005	284.3682	912.30	3.20816	0.03117
	0.8983	0.006	285.2805	906.60	3.17792	0.03147
	0.8993	0.007	286.1871	900.80	3.14759	0.03177
	0.9003	0.008	287.0879	894.50	3.11577	0.03209
	0.9013	0.009	287.9824	888.00	3.08352	0.03243
	0.9023	0.01	288.8704			
					δx_i avg. =	0.031
270 K	0.8923	0	243.0827	984.40	4.04965	0.02469
	0.8933	0.001	244.0671	989.40	4.05380	0.02467
	0.8943	0.002	245.0565	994.20	4.05702	0.02465
	0.8953	0.003	246.0507	998.50	4.05811	0.02464
	0.8963	0.004	247.0492	1002.60	4.05830	0.02464
	0.8973	0.005	248.0518	1006.60	4.05802	0.02464
	0.8983	0.006	249.0584	1010.10	4.05568	0.02466
	0.8993	0.007	250.0685	1013.50	4.05289	0.02467
	0.9003	0.008	251.0820	1016.60	4.04888	0.02470
	0.9013	0.009	252.0986	1019.70	4.04485	0.02472
	0.9023	0.01	253.1183			
					δx_i avg. =	0.025
290 K	0.8923	0	210.8903	978.50	4.63985	0.02155
	0.8933	0.001	211.8688	985.00	4.64910	0.02151
	0.8943	0.002	212.8538	991.10	4.65625	0.02148
	0.8953	0.003	213.8449	997.20	4.66319	0.02144
	0.8963	0.004	214.8421	1003.00	4.66854	0.02142
	0.8973	0.005	215.8451	1008.70	4.67326	0.02140

Table A.3.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8983	0.006	216.8538	1014.20	4.67688	0.02138
	0.8993	0.007	217.8680	1019.60	4.67990	0.02137
	0.9003	0.008	218.8876	1024.90	4.68231	0.02136
	0.9013	0.009	219.9125	1030.00	4.68368	0.02135
	0.9023	0.01	220.9425			
					δx_i avg. =	0.021
310 K	0.8923	0	184.7807	918.60	4.97130	0.02012
	0.8933	0.001	185.6993	924.30	4.97740	0.02009
	0.8943	0.002	186.6236	929.80	4.98222	0.02007
	0.8953	0.003	187.5534	935.40	4.98738	0.02005
	0.8963	0.004	188.4888	940.70	4.99075	0.02004
	0.8973	0.005	189.4295	946.10	4.99447	0.02002
	0.8983	0.006	190.3756	951.30	4.99696	0.02001
	0.8993	0.007	191.3269	956.40	4.99877	0.02000
	0.9003	0.008	192.2833	961.50	5.00043	0.02000
	0.9013	0.009	193.2448	966.60	5.00195	0.01999
	0.9023	0.01	194.2114			
					δx_i avg. =	0.020
330 K	0.8923	0	164.3316	836.30	5.08910	0.01965
	0.8933	0.001	165.1679	840.80	5.09058	0.01964
	0.8943	0.002	166.0087	845.30	5.09190	0.01964
	0.8953	0.003	166.8540	849.70	5.09248	0.01964
	0.8963	0.004	167.7037	854.10	5.09291	0.01964
	0.8973	0.005	168.5578	858.50	5.09321	0.01963
	0.8983	0.006	169.4163	862.70	5.09219	0.01964
	0.8993	0.007	170.2790	867.00	5.09164	0.01964
	0.9003	0.008	171.1460	871.30	5.09097	0.01964
	0.9013	0.009	172.0173	875.50	5.08960	0.01965
	0.9023	0.01	172.8928			
					δx_i avg. =	0.020

Table A.3.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	148.2815	755.40	5.09436	0.01963
	0.8933	0.001	149.0369	758.80	5.09136	0.01964
	0.8943	0.002	149.7957	762.20	5.08826	0.01965
	0.8953	0.003	150.5579	765.60	5.08509	0.01967
	0.8963	0.004	151.3235	768.90	5.08117	0.01968
	0.8973	0.005	152.0924	772.30	5.07783	0.01969
	0.8983	0.006	152.8647	775.60	5.07377	0.01971
	0.8993	0.007	153.6403	778.90	5.06963	0.01973
	0.9003	0.008	154.4192	782.30	5.06608	0.01974
	0.9013	0.009	155.2015	785.50	5.06116	0.01976
	0.9023	0.01	155.9870			
					δx_i avg. =	0.020

Table A.3.3 SonicWare® Calculations for the Case c Gas Mixture at 24.132 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	296.7518	968.90	3.26502	0.03063
	0.8933	0.001	297.7207	965.80	3.24398	0.03083
	0.8943	0.002	298.6865	962.20	3.22144	0.03104
	0.8953	0.003	299.6487	958.40	3.19841	0.03127
	0.8963	0.004	300.6071	954.00	3.17358	0.03151
	0.8973	0.005	301.5611	949.50	3.14862	0.03176
	0.8983	0.006	302.5106	944.50	3.12220	0.03203
	0.8993	0.007	303.4551	939.30	3.09535	0.03231
	0.9003	0.008	304.3944	933.90	3.06806	0.03259
	0.9013	0.009	305.3283	928.20	3.04001	0.03289
	0.9023	0.01	306.2565			
					δx_i avg. =	0.032
270 K	0.8923	0	264.0634	1001.90	3.79416	0.02636
	0.8933	0.001	265.0653	1006.70	3.79793	0.02633
	0.8943	0.002	266.0720	1011.10	3.80010	0.02632
	0.8953	0.003	267.0831	1015.10	3.80069	0.02631
	0.8963	0.004	268.0982	1019.10	3.80122	0.02631
	0.8973	0.005	269.1173	1022.60	3.79983	0.02632
	0.8983	0.006	270.1399	1025.90	3.79766	0.02633
	0.8993	0.007	271.1658	1029.10	3.79510	0.02635
	0.9003	0.008	272.1949	1032.00	3.79140	0.02638
	0.9013	0.009	273.2269	1034.80	3.78733	0.02640
	0.9023	0.01	274.2617			
					δx_i avg. =	0.026
290 K	0.8923	0	234.1502	997.40	4.25966	0.02348
	0.8933	0.001	235.1476	1003.60	4.26796	0.02343
	0.8943	0.002	236.1512	1009.50	4.27480	0.02339
	0.8953	0.003	237.1607	1015.10	4.28022	0.02336
	0.8963	0.004	238.1758	1020.70	4.28549	0.02333
	0.8973	0.005	239.1965	1026.00	4.28936	0.02331

Table A.3.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8983	0.006	240.2225	1031.10	4.29227	0.02330
	0.8993	0.007	241.2536	1036.10	4.29465	0.02328
	0.9003	0.008	242.2897	1041.00	4.29651	0.02327
	0.9013	0.009	243.3307	1045.80	4.29785	0.02327
	0.9023	0.01	244.3765			
					δx_i avg. =	0.023
310 K	0.8923	0	208.3726	958.30	4.59897	0.02174
	0.8933	0.001	209.3309	963.90	4.60467	0.02172
	0.8943	0.002	210.2948	969.30	4.60924	0.02170
	0.8953	0.003	211.2641	974.60	4.61318	0.02168
	0.8963	0.004	212.2387	979.70	4.61603	0.02166
	0.8973	0.005	213.2184	984.80	4.61874	0.02165
	0.8983	0.006	214.2032	989.70	4.62038	0.02164
	0.8993	0.007	215.1929	994.60	4.62190	0.02164
	0.9003	0.008	216.1875	999.30	4.62238	0.02163
	0.9013	0.009	217.1868	1004.00	4.62275	0.02163
	0.9023	0.01	218.1908			
					δx_i avg. =	0.022
330 K	0.8923	0	187.0530	895.20	4.78581	0.02090
	0.8933	0.001	187.9482	899.70	4.78696	0.02089
	0.8943	0.002	188.8479	904.10	4.78745	0.02089
	0.8953	0.003	189.7520	908.50	4.78783	0.02089
	0.8963	0.004	190.6605	912.80	4.78757	0.02089
	0.8973	0.005	191.5733	917.10	4.78720	0.02089
	0.8983	0.006	192.4904	921.20	4.78569	0.02090
	0.8993	0.007	193.4116	925.40	4.78461	0.02090
	0.9003	0.008	194.3370	929.40	4.78241	0.02091
	0.9013	0.009	195.2664	933.50	4.78065	0.02092
	0.9023	0.01	196.1999			
					δx_i avg. =	0.021

Table A.3.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	169.6776	825.00	4.86216	0.02057
	0.8933	0.001	170.5026	828.60	4.85975	0.02058
	0.8943	0.002	171.3312	831.90	4.85551	0.02060
	0.8953	0.003	172.1631	835.50	4.85296	0.02061
	0.8963	0.004	172.9986	838.80	4.84859	0.02062
	0.8973	0.005	173.8374	842.10	4.84418	0.02064
	0.8983	0.006	174.6795	845.50	4.84029	0.02066
	0.8993	0.007	175.5250	848.80	4.83578	0.02068
	0.9003	0.008	176.3738	852.10	4.83122	0.02070
	0.9013	0.009	177.2259	855.30	4.82604	0.02072
	0.9023	0.01	178.0812			
					δx_i avg. =	0.021

Table A.3.4. SonicWare® Calculations for the Case C Gas Mixture at 27.579 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	310.1830	989.50	3.19005	0.03135
	0.8913	0.001	311.1725	986.70	3.17091	0.03154
	0.8903	0.002	312.1592	983.40	3.15032	0.03174
	0.8893	0.003	313.1426	979.60	3.12829	0.03197
	0.8883	0.004	314.1222	975.60	3.10580	0.03220
	0.8873	0.005	315.0978	971.30	3.08254	0.03244
	0.8863	0.006	316.0691	966.70	3.05851	0.03270
	0.8853	0.007	317.0358	961.80	3.03373	0.03296
	0.8843	0.008	317.9976	956.70	3.00851	0.03324
	0.8833	0.009	318.9543	951.30	2.98256	0.03353
	0.8823	0.01	319.9056			
					δx_i avg. =	0.032
270 K	0.8923	0	280.5101	1017.20	3.62625	0.02758
	0.8913	0.001	281.5273	1021.40	3.62807	0.02756
	0.8903	0.002	282.5487	1025.40	3.62911	0.02755
	0.8893	0.003	283.5741	1029.10	3.62903	0.02756
	0.8883	0.004	284.6032	1032.50	3.62786	0.02756
	0.8873	0.005	285.6357	1035.60	3.62560	0.02758
	0.8863	0.006	286.6713	1038.60	3.62296	0.02760
	0.8853	0.007	287.7099	1041.20	3.61892	0.02763
	0.8843	0.008	288.7511	1043.80	3.61488	0.02766
	0.8833	0.009	289.7949	1046.00	3.60945	0.02771
	0.8823	0.01	290.8409			
					δx_i avg. =	0.028
290 K	0.8923	0	252.7767	1010.80	3.99879	0.02501
	0.8913	0.001	253.7875	1016.60	4.00571	0.02496
	0.8903	0.002	254.8041	1022.10	4.01132	0.02493
	0.8893	0.003	255.8262	1027.40	4.01601	0.02490
	0.8883	0.004	256.8536	1032.50	4.01980	0.02488
	0.8873	0.005	257.8861	1037.40	4.02271	0.02486

Table A.3.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8863	0.006	258.9235	1042.10	4.02474	0.02485
	0.8853	0.007	259.9656	1046.70	4.02630	0.02484
	0.8843	0.008	261.0123	1051.10	4.02701	0.02483
	0.8833	0.009	262.0634	1055.40	4.02727	0.02483
	0.8823	0.01	263.1188			
					δx_i avg. =	0.025
310 K	0.8923	0	228.0209	982.00	4.30662	0.02322
	0.8913	0.001	229.0029	987.30	4.31130	0.02319
	0.8903	0.002	229.9902	992.40	4.31497	0.02318
	0.8893	0.003	230.9826	997.40	4.31807	0.02316
	0.8883	0.004	231.9800	1002.20	4.32020	0.02315
	0.8873	0.005	232.9822	1006.90	4.32179	0.02314
	0.8863	0.006	233.9891	1011.50	4.32285	0.02313
	0.8853	0.007	235.0006	1015.90	4.32297	0.02313
	0.8843	0.008	236.0165	1020.30	4.32300	0.02313
	0.8833	0.009	237.0368	1024.60	4.32254	0.02313
	0.8823	0.01	238.0614			
					δx_i avg. =	0.023
330 K	0.8923	0	206.6978	933.60	4.51674	0.02214
	0.8913	0.001	207.6314	938.00	4.51762	0.02214
	0.8903	0.002	208.5694	942.20	4.51744	0.02214
	0.8893	0.003	209.5116	946.40	4.51717	0.02214
	0.8883	0.004	210.4580	950.50	4.51634	0.02214
	0.8873	0.005	211.4085	954.50	4.51496	0.02215
	0.8863	0.006	212.3630	958.50	4.51350	0.02216
	0.8853	0.007	213.3215	962.20	4.51056	0.02217
	0.8843	0.008	214.2837	966.10	4.50851	0.02218
	0.8833	0.009	215.2498	969.80	4.50546	0.02220
	0.8823	0.01	216.2196			
					δx_i avg. =	0.022

Table A.3.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	188.7149	874.80	4.63556	0.02157
	0.8913	0.001	189.5897	878.20	4.63211	0.02159
	0.8903	0.002	190.4679	881.60	4.62860	0.02160
	0.8893	0.003	191.3495	885.00	4.62504	0.02162
	0.8883	0.004	192.2345	888.20	4.62040	0.02164
	0.8873	0.005	193.1227	891.50	4.61624	0.02166
	0.8863	0.006	194.0142	894.70	4.61152	0.02168
	0.8853	0.007	194.9089	897.90	4.60677	0.02171
	0.8843	0.008	195.8068	900.90	4.60096	0.02173
	0.8833	0.009	196.7077	904.10	4.59616	0.02176
	0.8823	0.01	197.6118			
					δx_i avg. =	0.022

Table A.3.5. SonicWare® Calculations for the Case C Gas Mixture at 31.026 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	321.2806	1001.90	3.11846	0.03207
	0.8913	0.001	322.2825	999.00	3.09976	0.03226
	0.8903	0.002	323.2815	995.80	3.08029	0.03246
	0.8893	0.003	324.2773	992.30	3.06004	0.03268
	0.8883	0.004	325.2696	988.30	3.03840	0.03291
	0.8873	0.005	326.2579	984.20	3.01663	0.03315
	0.8863	0.006	327.2421	979.80	2.99411	0.03340
	0.8853	0.007	328.2219	975.10	2.97086	0.03366
	0.8843	0.008	329.1970	970.20	2.94717	0.03393
	0.8833	0.009	330.1672	965.10	2.92306	0.03421
	0.8823	0.01	331.1323			
					δx_i avg. =	0.033
270 K	0.8923	0	293.9591	1028.40	3.49845	0.02858
	0.8913	0.001	294.9875	1032.10	3.49879	0.02858
	0.8903	0.002	296.0196	1035.70	3.49875	0.02858
	0.8893	0.003	297.0553	1038.90	3.49733	0.02859
	0.8883	0.004	298.0942	1041.80	3.49487	0.02861
	0.8873	0.005	299.1360	1044.50	3.49172	0.02864
	0.8863	0.006	300.1805	1046.90	3.48757	0.02867
	0.8853	0.007	301.2274	1049.10	3.48275	0.02871
	0.8843	0.008	302.2765	1051.10	3.47728	0.02876
	0.8833	0.009	303.3276	1053.00	3.47149	0.02881
	0.8823	0.01	304.3806			
					δx_i avg. =	0.029
290 K	0.8923	0	268.1013	1021.40	3.80975	0.02625
	0.8913	0.001	269.1227	1026.80	3.81536	0.02621
	0.8903	0.002	270.1495	1031.90	3.81974	0.02618
	0.8893	0.003	271.1814	1036.80	3.82327	0.02616
	0.8883	0.004	272.2182	1041.40	3.82561	0.02614
	0.8873	0.005	273.2596	1045.90	3.82750	0.02613

Table A.3.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8863	0.006	274.3055	1050.20	3.82858	0.02612
	0.8853	0.007	275.3557	1054.30	3.82887	0.02612
	0.8843	0.008	276.4100	1058.30	3.82873	0.02612
	0.8833	0.009	277.4683	1062.10	3.82782	0.02612
	0.8823	0.01	278.5304			
					δx_i avg. =	0.026
310 K	0.8923	0	244.5273	997.50	4.07930	0.02451
	0.8913	0.001	245.5248	1002.60	4.08350	0.02449
	0.8903	0.002	246.5274	1007.30	4.08596	0.02447
	0.8893	0.003	247.5347	1012.00	4.08832	0.02446
	0.8883	0.004	248.5467	1016.40	4.08937	0.02445
	0.8873	0.005	249.5631	1020.80	4.09035	0.02445
	0.8863	0.006	250.5839	1025.00	4.09045	0.02445
	0.8853	0.007	251.6089	1029.10	4.09008	0.02445
	0.8843	0.008	252.6380	1033.10	4.08925	0.02445
	0.8833	0.009	253.6711	1036.90	4.08758	0.02446
	0.8823	0.01	254.708			
					δx_i avg. =	0.024
330 K	0.8923	0	223.6507	959.20	4.28883	0.02332
	0.8913	0.001	224.6099	963.40	4.28921	0.02331
	0.8903	0.002	225.5733	967.40	4.28863	0.02332
	0.8893	0.003	226.5407	971.30	4.28753	0.02332
	0.8883	0.004	227.5120	975.20	4.28637	0.02333
	0.8873	0.005	228.4872	978.80	4.28383	0.02334
	0.8863	0.006	229.4660	982.50	4.28168	0.02336
	0.8853	0.007	230.4485	986.00	4.27861	0.02337
	0.8843	0.008	231.4345	989.60	4.27594	0.02339
	0.8833	0.009	232.4241	992.90	4.27193	0.02341
	0.8823	0.01	233.417			
					δx_i avg. =	0.023

Table A.3.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	205.5469	910.40	4.42916	0.02258
	0.8913	0.001	206.4573	913.70	4.42561	0.02260
	0.8903	0.002	207.3710	917.00	4.42203	0.02261
	0.8893	0.003	208.2880	920.10	4.41744	0.02264
	0.8883	0.004	209.2081	923.30	4.41331	0.02266
	0.8873	0.005	210.1314	926.30	4.40819	0.02269
	0.8863	0.006	211.0577	929.30	4.40306	0.02271
	0.8853	0.007	211.9870	932.20	4.39744	0.02274
	0.8843	0.008	212.9192	935.10	4.39181	0.02277
	0.8833	0.009	213.8543	937.90	4.38570	0.02280
	0.8823	0.01	214.7922			
					δx_i avg. =	0.023

Table A.3.6. SonicWare® Calculations for the Case C Gas Mixture at 34.474 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	330.7483	1009.00	3.05066	0.03278
	0.8913	0.001	331.7573	1006.30	3.03324	0.03297
	0.8903	0.002	332.7636	1003.10	3.01445	0.03317
	0.8893	0.003	333.7667	999.70	2.99521	0.03339
	0.8883	0.004	334.7664	996.00	2.97521	0.03361
	0.8873	0.005	335.7624	991.90	2.95417	0.03385
	0.8863	0.006	336.7543	987.60	2.93270	0.03410
	0.8853	0.007	337.7419	983.10	2.91080	0.03435
	0.8843	0.008	338.7250	978.40	2.88848	0.03462
	0.8833	0.009	339.7034	973.40	2.86544	0.03490
	0.8823	0.01	340.6768			
					δx_i avg. =	0.034
270 K	0.8923	0	305.3098	1036.00	3.39327	0.02947
	0.8913	0.001	306.3458	1039.30	3.39257	0.02948
	0.8903	0.002	307.3851	1042.40	3.39119	0.02949
	0.8893	0.003	308.4275	1045.20	3.38880	0.02951
	0.8883	0.004	309.4727	1047.70	3.38544	0.02954
	0.8873	0.005	310.5204	1049.90	3.38110	0.02958
	0.8863	0.006	311.5703	1051.80	3.37580	0.02962
	0.8853	0.007	312.6221	1053.70	3.37052	0.02967
	0.8843	0.008	313.6758	1055.20	3.36398	0.02973
	0.8833	0.009	314.7310	1056.50	3.35683	0.02979
	0.8823	0.01	315.7875			
					δx_i avg. =	0.030
290 K	0.8923	0	281.0382	1029.80	3.66427	0.02729
	0.8913	0.001	282.0680	1034.80	3.66862	0.02726
	0.8903	0.002	283.1028	1039.50	3.67181	0.02723
	0.8893	0.003	284.1423	1043.90	3.67386	0.02722
	0.8883	0.004	285.1862	1048.10	3.67514	0.02721
	0.8873	0.005	286.2343	1052.20	3.67601	0.02720

Table A.3.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8863	0.006	287.2865	1056.10	3.67612	0.02720
	0.8853	0.007	288.3426	1059.70	3.67514	0.02721
	0.8843	0.008	289.4023	1063.20	3.67378	0.02722
	0.8833	0.009	290.4655	1066.60	3.67204	0.02723
	0.8823	0.01	291.5321			
					δx_i avg. =	0.027
310 K	0.8923	0	258.6044	1008.80	3.90094	0.02563
	0.8913	0.001	259.6132	1013.50	3.90388	0.02562
	0.8903	0.002	260.6267	1018.00	3.90597	0.02560
	0.8893	0.003	261.6447	1022.30	3.90721	0.02559
	0.8883	0.004	262.6670	1026.40	3.90761	0.02559
	0.8873	0.005	263.6934	1030.50	3.90795	0.02559
	0.8863	0.006	264.7239	1034.30	3.90709	0.02559
	0.8853	0.007	265.7582	1038.00	3.90581	0.02560
	0.8843	0.008	266.7962	1041.60	3.90410	0.02561
	0.8833	0.009	267.8378	1045.20	3.90236	0.02563
	0.8823	0.01	268.883			
					δx_i avg. =	0.026
330 K	0.8923	0	238.3622	976.90	4.09838	0.02440
	0.8913	0.001	239.3391	981.00	4.09879	0.02440
	0.8903	0.002	240.3201	984.60	4.09704	0.02441
	0.8893	0.003	241.3047	988.40	4.09607	0.02441
	0.8883	0.004	242.2931	991.90	4.09380	0.02443
	0.8873	0.005	243.2850	995.30	4.09109	0.02444
	0.8863	0.006	244.2803	998.70	4.08834	0.02446
	0.8853	0.007	245.2790	1001.90	4.08474	0.02448
	0.8843	0.008	246.2809	1005.10	4.08111	0.02450
	0.8833	0.009	247.2860	1008.10	4.07666	0.02453
	0.8823	0.01	248.294			
					δx_i avg. =	0.024

Table A.3.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	220.4324	936.10	4.24665	0.02355
	0.8913	0.001	221.3685	939.30	4.24315	0.02357
	0.8903	0.002	222.3078	942.40	4.23917	0.02359
	0.8893	0.003	223.2502	945.40	4.23471	0.02361
	0.8883	0.004	224.1956	948.20	4.22934	0.02364
	0.8873	0.005	225.1438	951.10	4.22441	0.02367
	0.8863	0.006	226.0949	953.80	4.21858	0.02370
	0.8853	0.007	227.0487	956.50	4.21275	0.02374
	0.8843	0.008	228.0052	959.10	4.20648	0.02377
	0.8833	0.009	228.9643	961.70	4.20022	0.02381
	0.8823	0.01	229.9260			
					δx_i avg. =	0.024

Table A.3.7. SonicWare® Calculations for the Case C Gas Mixture at 37.921 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
250 K	0.8923	0	339.0167	1013.00	2.98805	0.03347
	0.8913	0.001	340.0297	1010.30	2.97121	0.03366
	0.8903	0.002	341.0400	1007.40	2.95391	0.03385
	0.8893	0.003	342.0474	1004.10	2.93556	0.03407
	0.8883	0.004	343.0515	1000.40	2.91618	0.03429
	0.8873	0.005	344.0519	996.50	2.89637	0.03453
	0.8863	0.006	345.0484	992.30	2.87583	0.03477
	0.8853	0.007	346.0407	988.00	2.85516	0.03502
	0.8843	0.008	347.0287	983.30	2.83348	0.03529
	0.8833	0.009	348.0120	978.70	2.81226	0.03556
	0.8823	0.01	348.9907			
					δx_i avg. =	0.034
270 K	0.8923	0	315.1220	1040.80	3.30285	0.03028
	0.8913	0.001	316.1628	1043.80	3.30146	0.03029
	0.8903	0.002	317.2066	1046.60	3.29943	0.03031
	0.8893	0.003	318.2532	1048.90	3.29580	0.03034
	0.8883	0.004	319.3021	1051.00	3.29155	0.03038
	0.8873	0.005	320.3531	1052.90	3.28669	0.03043
	0.8863	0.006	321.4060	1054.50	3.28090	0.03048
	0.8853	0.007	322.4605	1055.80	3.27420	0.03054
	0.8843	0.008	323.5163	1057.10	3.26753	0.03060
	0.8833	0.009	324.5734	1058.00	3.25966	0.03068
	0.8823	0.01	325.6314			
					δx_i avg. =	0.030
290 K	0.8923	0	292.1970	1036.20	3.54624	0.02820
	0.8913	0.001	293.2332	1040.80	3.54939	0.02817
	0.8903	0.002	294.2740	1045.10	3.55145	0.02816
	0.8893	0.003	295.3191	1049.20	3.55277	0.02815
	0.8883	0.004	296.3683	1053.00	3.55301	0.02815
	0.8873	0.005	297.4213	1056.60	3.55254	0.02815

Table A.3.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
290 K	0.8863	0.006	298.4779	1060.00	3.55135	0.02816
	0.8853	0.007	299.5379	1063.30	3.54980	0.02817
	0.8843	0.008	300.6012	1066.40	3.54756	0.02819
	0.8833	0.009	301.6676	1069.20	3.54430	0.02821
	0.8823	0.01	302.7368			
					δx_i avg. =	0.028
310 K	0.8923	0	270.8036	1017.40	3.75697	0.02662
	0.8913	0.001	271.8210	1021.90	3.75946	0.02660
	0.8903	0.002	272.8429	1026.10	3.76077	0.02659
	0.8893	0.003	273.8690	1030.00	3.76092	0.02659
	0.8883	0.004	274.8990	1033.90	3.76102	0.02659
	0.8873	0.005	275.9329	1037.60	3.76033	0.02659
	0.8863	0.006	276.9705	1041.10	3.75888	0.02660
	0.8853	0.007	278.0116	1044.50	3.75704	0.02662
	0.8843	0.008	279.0561	1047.70	3.75444	0.02664
	0.8833	0.009	280.1038	1050.90	3.75182	0.02665
	0.8823	0.01	281.1547			
					δx_i avg. =	0.027
330 K	0.8923	0	251.2463	990.00	3.94036	0.02538
	0.8913	0.001	252.2363	993.60	3.93916	0.02539
	0.8903	0.002	253.2299	997.30	3.93832	0.02539
	0.8893	0.003	254.2272	1000.60	3.93585	0.02541
	0.8883	0.004	255.2278	1003.90	3.93335	0.02542
	0.8873	0.005	256.2317	1007.10	3.93043	0.02544
	0.8863	0.006	257.2388	1010.20	3.92709	0.02546
	0.8853	0.007	258.2490	1013.10	3.92296	0.02549
	0.8843	0.008	259.2621	1016.00	3.91881	0.02552
	0.8833	0.009	260.2781	1018.70	3.91389	0.02555
	0.8823	0.01	261.2968			
					δx_i avg. =	0.025

Table A.3.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
350 K	0.8923	0	233.6494	955.20	4.08818	0.02446
	0.8913	0.001	234.6046	958.20	4.08432	0.02448
	0.8903	0.002	235.5628	961.00	4.07959	0.02451
	0.8893	0.003	236.5238	963.80	4.07485	0.02454
	0.8883	0.004	237.4876	966.50	4.06969	0.02457
	0.8873	0.005	238.4541	969.00	4.06368	0.02461
	0.8863	0.006	239.4231	971.60	4.05809	0.02464
	0.8853	0.007	240.3947	974.00	4.05167	0.02468
	0.8843	0.008	241.3687	976.40	4.04526	0.02472
	0.8833	0.009	242.3451	978.70	4.03846	0.02476
	0.8823	0.01	243.3238			
					δx_i avg. =	0.025

APPENDIX B

THE NIST-14 CALCULATIONS

Tables B.1 to B.1.7 show calculations for the Case A gas mixture from 13.789 to 37.921 MPa and temperature from 230 K to 350 K. Tables B.2 to B.2.7 show calculations for the Case B gas mixture from 13.789 to 37.921 MPa and temperature from 230 K to 350 K. Tables B.3 to B.3.7 show calculations for the Case C gas mixture from 13.789 to 37.921 MPa and temperature from 230 K to 310 K

Because NIST 14 is able to predict density in the liquid region, the lowest temperature was 230 K. Even though a temperature at 230 K is not considered to be in the supercritical region, the densities were needed to provide better understanding for the compositional dependence at various temperatures.

The results are summarized as follows. Table 8, Figure 11 and Figure 12 show the average change in mole fraction that changes the mass density by 0.1% (dxi) for gas mixture A. The lowest values (dxi=0.015%) occur at temperatures of 310 K and 330 K, at a pressure of 13.789 MPa. The phase behavior prediction for Case A, gives a critical temperature of 284.11 K when the mole fraction of methane is 66.59% and that of heptane is 1.07%. The most stringent measurement requirement occurs in the supercritical retrograde region for this gas.

Table 8. Average Change in Mole Fraction of C_7H_{14} that Changes the Density by 0.1 Percent for Gas Mixture A Using NIST-14

T (K)	p (MPa)							
	13.789	17.237	20.684	24.132	27.579	31.026	34.474	37.921
	δx_i avg. (mol %)							
230	0.034	0.036	0.038	0.040	0.042	0.043	0.044	0.045
250	0.028	0.031	0.034	0.036	0.038	0.039	0.041	0.042
270	0.022	0.026	0.030	0.032	0.034	0.036	0.038	0.039
290	0.017	0.022	0.026	0.029	0.031	0.033	0.035	0.037
310	0.015	0.019	0.023	0.026	0.028	0.031	0.032	0.034
330	0.015	0.018	0.021	0.024	0.026	0.029	0.030	0.032
350	0.017	0.018	0.020	0.023	0.025	0.027	0.029	0.031

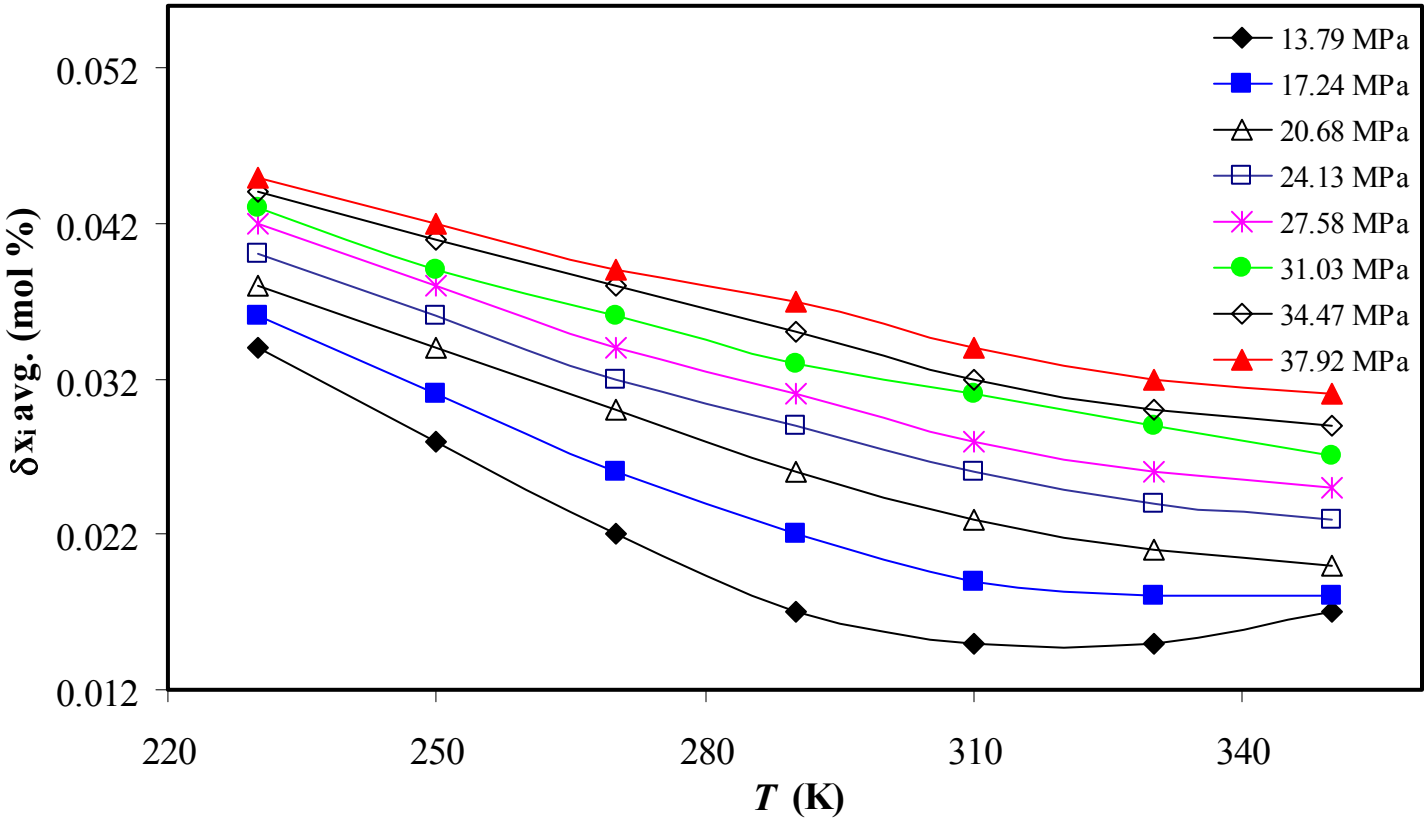

Figure 11. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture A Using NIST-14

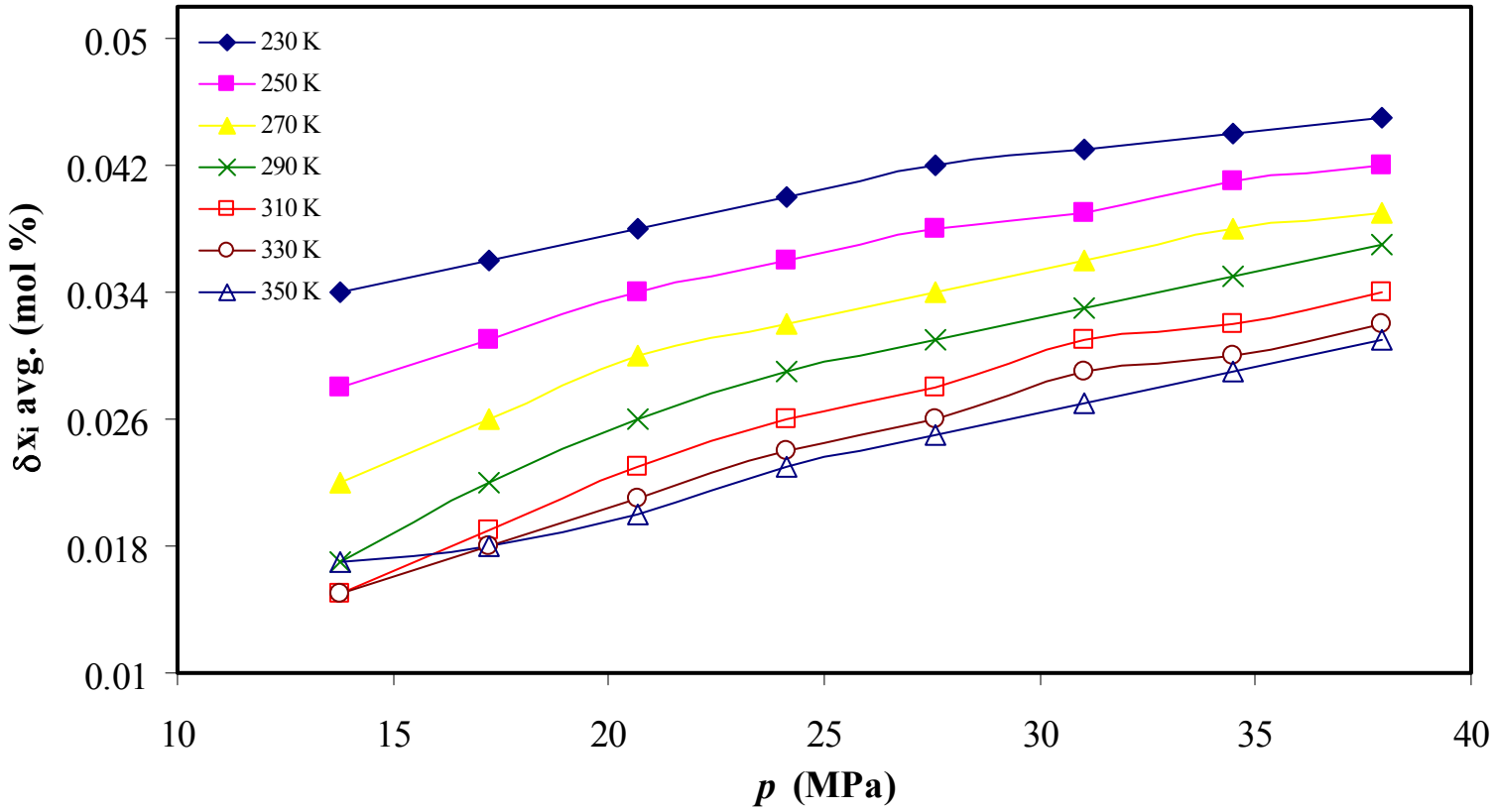

Figure 12. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Pressure for Gas Mixture A Using NIST-14

Table 9, Figure 13, and Figure 14 show the change in mole fraction that changes the mass densities by 0.1% (δx_i) for gas mixture C. The lowest δx_i, which is 0.013 mol %, occurs at temperatures of 290 K and at a pressure of 13.789 MPa.

Table 9. Average Change in Mole Fraction of C_7H_{14} that Changes the Density by 0.1 Percent for Gas Mixture B Using NIST-14

T (K)	*p* (MPa)							
	13.789	17.237	20.684	24.132	27.579	31.026	34.474	37.921
	δx_i avg. (mol %)							
230	0.028	0.030	0.033	0.034	0.037	0.037	0.039	0.040
250	0.022	0.025	0.028	0.031	0.033	0.034	0.036	0.037
270	0.016	0.021	0.024	0.027	0.029	0.031	0.033	0.034
290	0.013	0.018	0.021	0.024	0.027	0.029	0.030	0.032
310	0.014	0.016	0.019	0.022	0.024	0.027	0.028	0.030
330	0.015	0.017	0.019	0.021	0.023	0.025	0.027	0.028
350	0.017	0.018	0.019	0.021	0.022	0.024	0.026	0.027

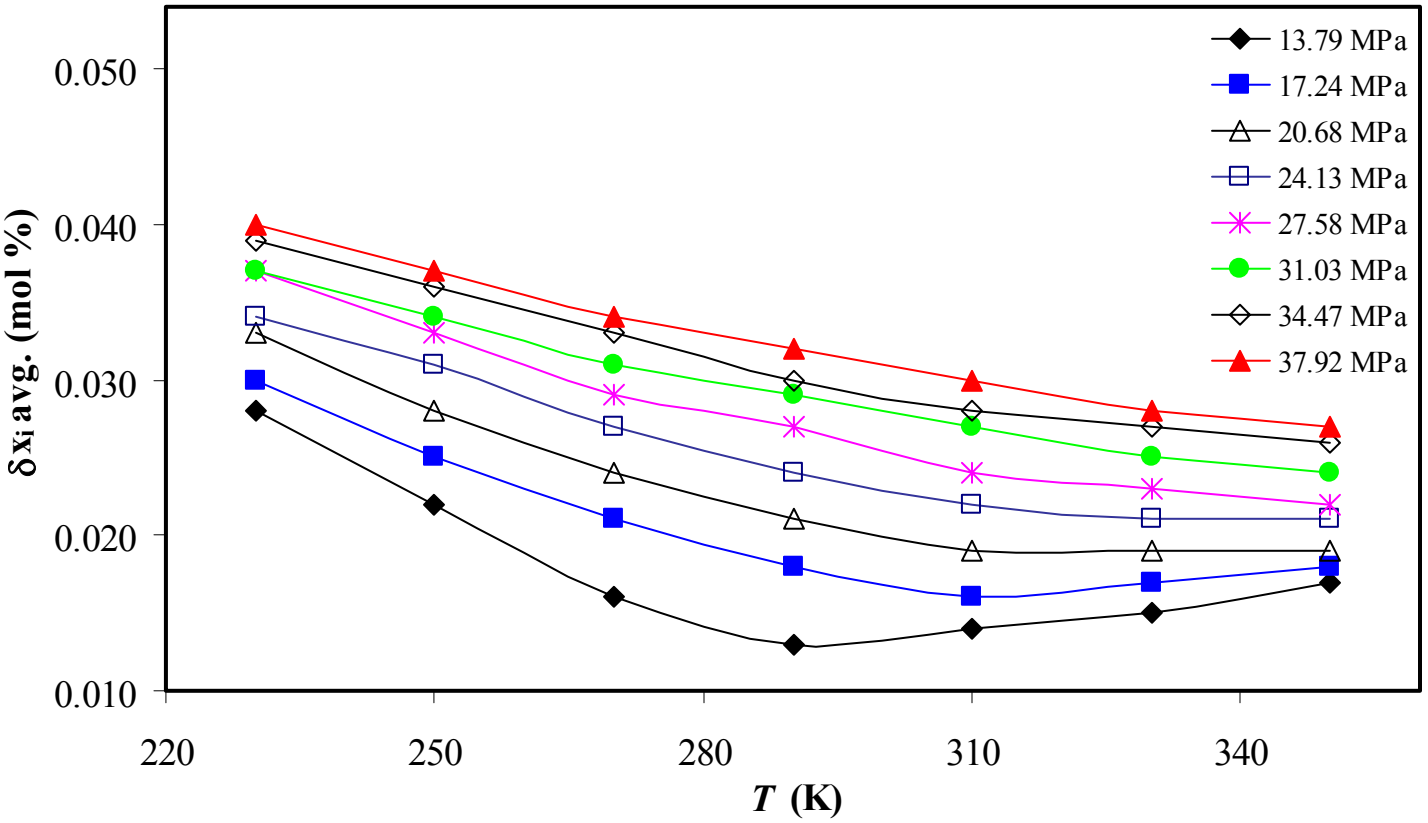

Figure 13. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture B Using NIST-14

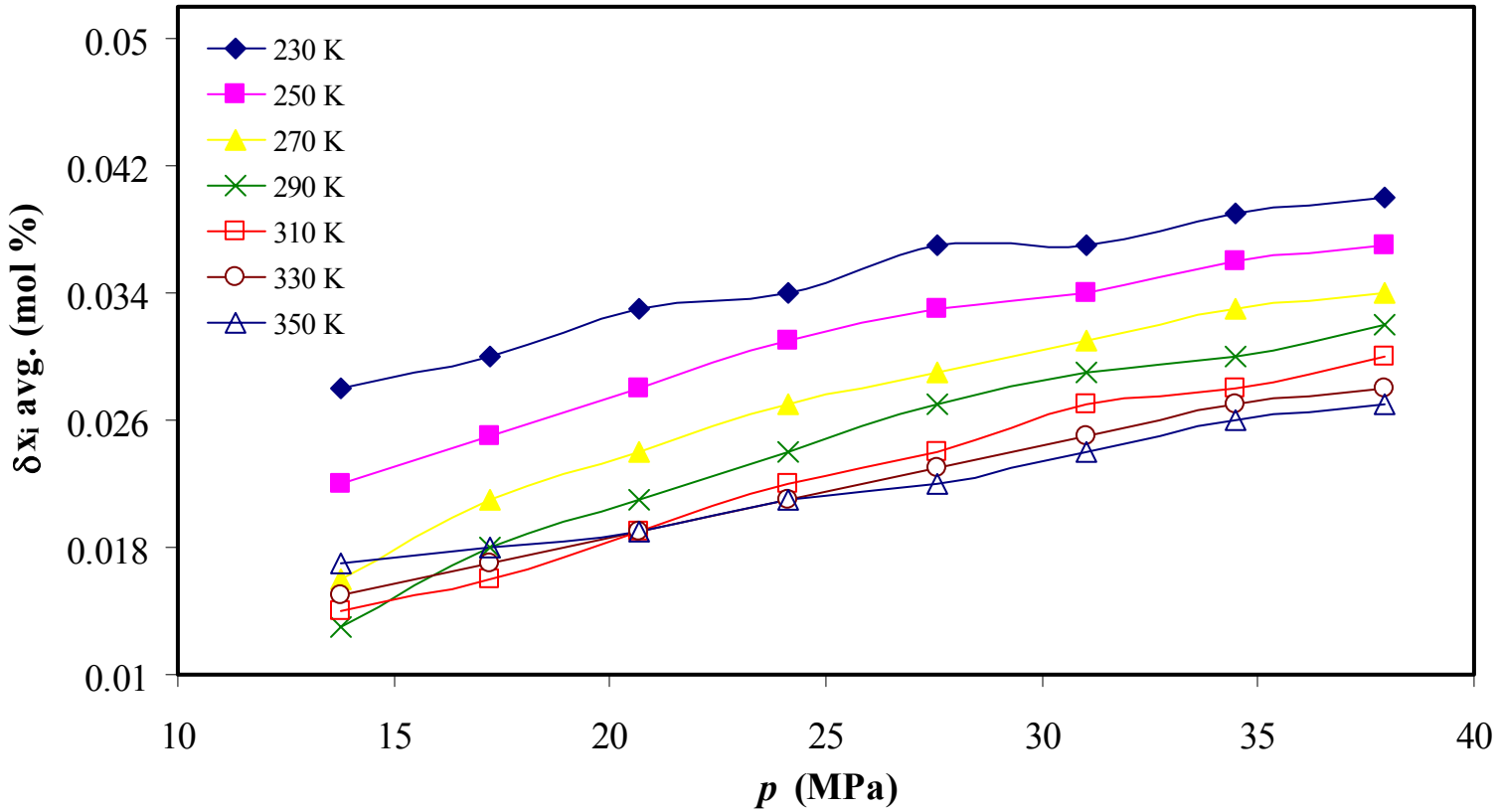

Figure 14. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Pressure for Gas Mixture B Using NIST-14

Table 10, Figure 15, and Figure 16 show the change in mole fraction of *n*-C_7H_{14} that changes the mixture mass densities by 0.1% for gas the case C gas mixture. The values range from 0.011 to 0.028 mol %, with the minimum values occurring in the 250 to 270 K and at a pressure of 13.789 MPa.

Table 10. Average Change in Mole Fraction of C_7H_{14} that Changes the Density by 0.1 Percent for Gas Mixture A Using NIST-14

T (K)	*p* (MPa)							
	13.789	17.237	20.684	24.132	27.579	31.026	34.474	37.921
	δx_i avg. (mol %)							
230	0.015	0.018	0.021	0.023	0.025	0.026	0.027	0.028
250	0.012	0.015	0.018	0.020	0.022	0.024	0.025	0.026
270	0.011	0.014	0.016	0.018	0.02	0.022	0.023	0.024
290	0.013	0.014	0.016	0.017	0.019	0.021	0.022	0.023
310	0.015	0.015	0.016	0.017	0.018	0.020	0.020	0.021

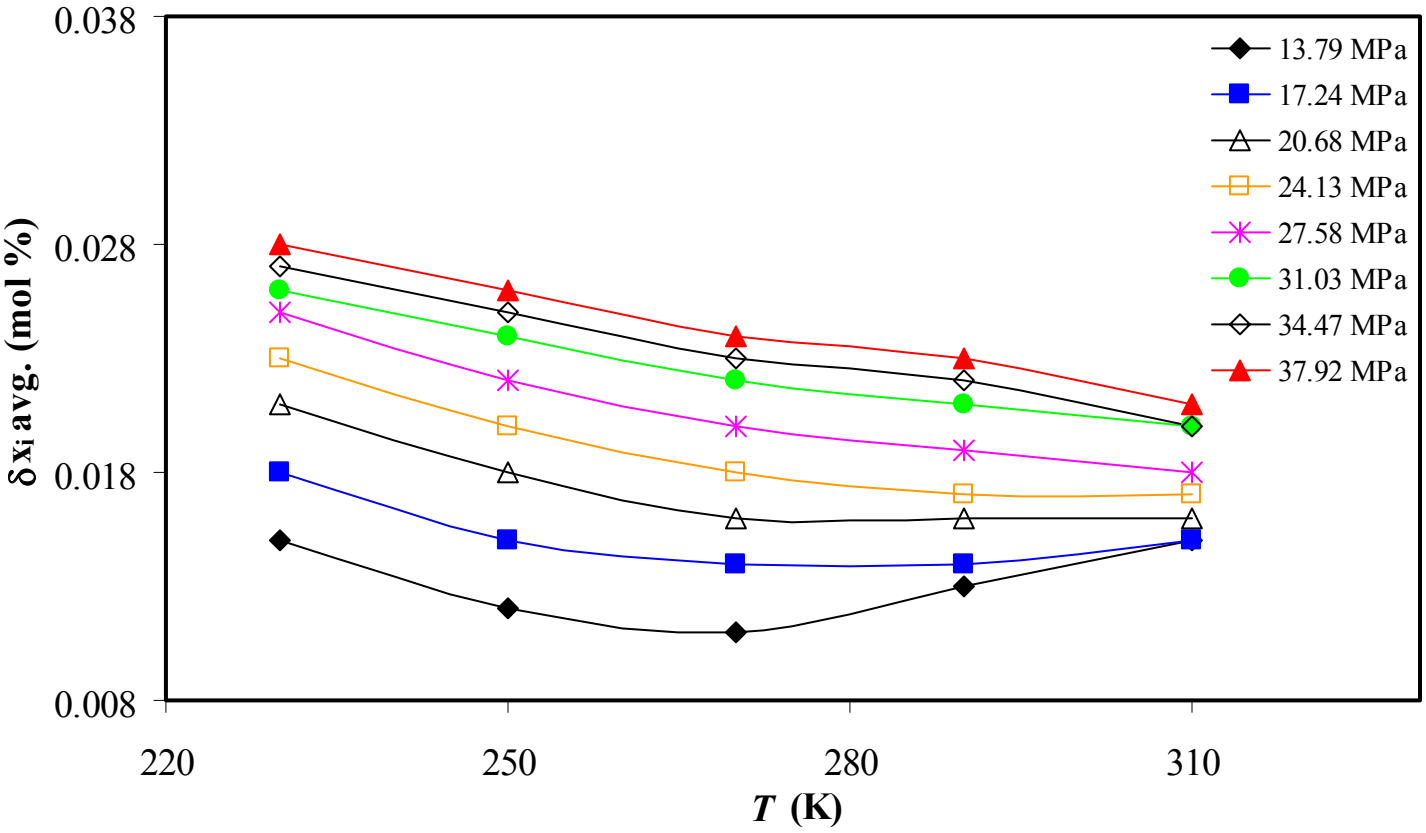

Figure 15. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Temperature for Gas Mixture C from 230 K to 310 K Using NIST-14

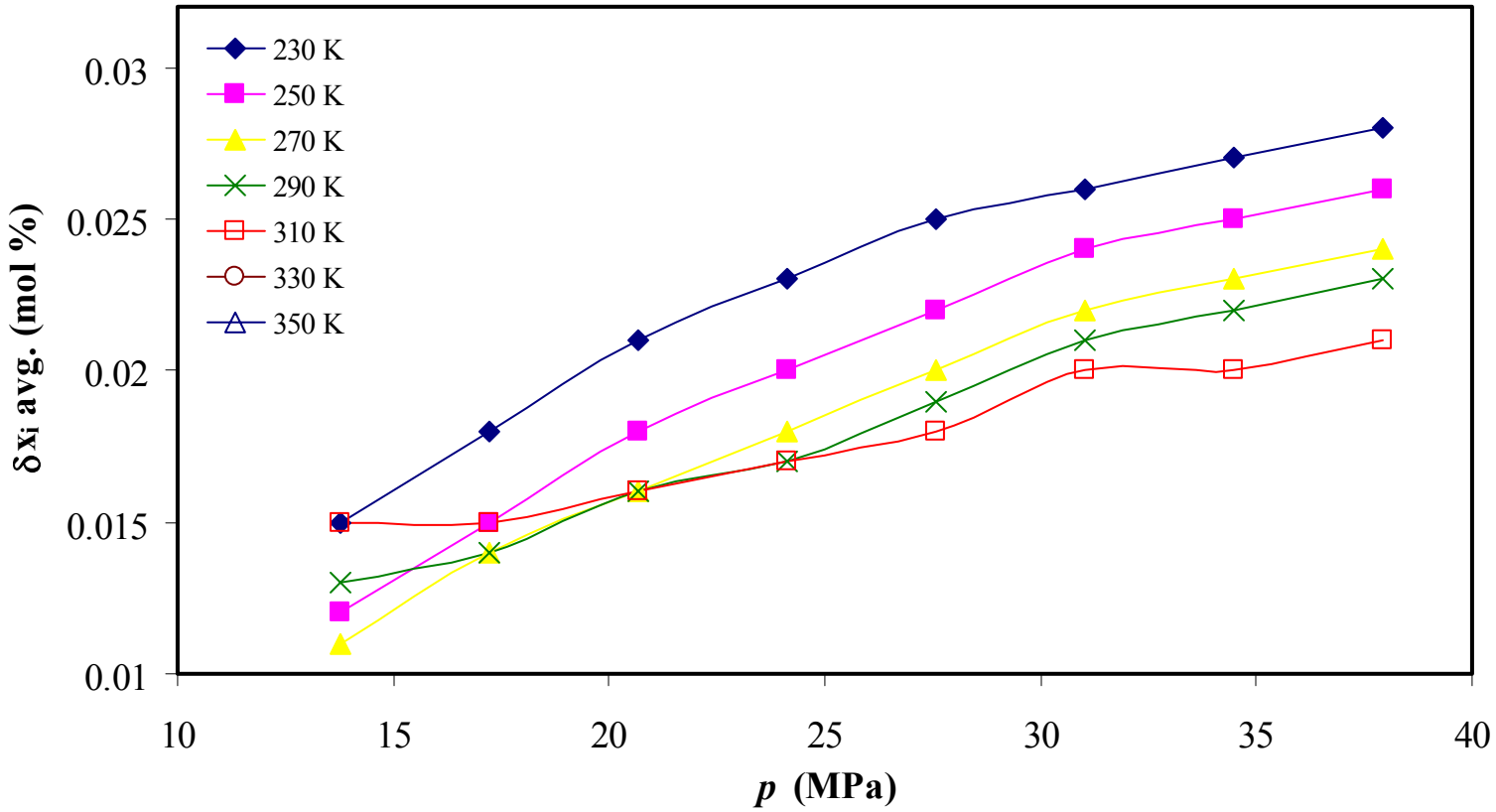

Figure 16. The Change in Mole Fraction Required to Change the Mass Density by 0.1% as a Function of Pressure for Gas Mixture C Using NIST-14

Table B.1. NIST Data for the Case A Gas Mixture at 13.79 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	Dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	412.658	1176.00	2.84982	0.03509
	0.6669	0.0097	411.482	1182.00	2.87254	0.03481
	0.6679	0.0087	410.300	1187.00	2.89301	0.03457
	0.6689	0.0077	409.113	1193.00	2.91606	0.03429
	0.6699	0.0067	407.920	1198.00	2.93685	0.03405
	0.6709	0.0057	406.722	1204.00	2.96025	0.03378
	0.6719	0.0047	405.518	1209.00	2.98137	0.03354
	0.6729	0.0037	404.309	1215.00	3.00513	0.03328
	0.6739	0.0027	403.094	1219.00	3.02411	0.03307
	0.6749	0.0017	401.875	1226.00	3.05070	0.03278
	0.6759	0.0007	400.649			
					δx_i avg. =	0.034
250 K	0.6659	0.0107	377.003	1301.00	3.45090	0.02898
	0.6669	0.0097	375.702	1309.00	3.48414	0.02870
	0.6679	0.0087	374.393	1315.00	3.51235	0.02847
	0.6689	0.0077	373.078	1321.00	3.54081	0.02824
	0.6699	0.0067	371.757	1329.00	3.57492	0.02797
	0.6709	0.0057	370.428	1336.00	3.60664	0.02773
	0.6719	0.0047	369.092	1343.00	3.63866	0.02748
	0.6729	0.0037	367.749	1350.00	3.67098	0.02724
	0.6739	0.0027	366.399	1357.00	3.70361	0.02700
	0.6749	0.0017	365.042	1365.00	3.73930	0.02674
	0.6759	0.0007	363.677			
					δx_i avg. =	0.028
270 K	0.6659	0.0107	335.591	1476.00	4.39821	0.02274
	0.6669	0.0097	334.115	1485.00	4.44458	0.02250
	0.6679	0.0087	332.630	1494.00	4.49148	0.02226
	0.6689	0.0077	331.136	1501.00	4.53288	0.02206
	0.6699	0.0067	329.635	1510.00	4.58082	0.02183
	0.6709	0.0057	328.125	1519.00	4.62933	0.02160
	0.6719	0.0047	326.606	1527.00	4.67536	0.02139

Table B.1. (Continued)

Isotherm	C1	C7	ρ (kg/m^3)	dρ/dx	(dρ/dx)(1/ρ)	dxi * 10^{-3} 1/(dρ/dx)(1/ρ)
270 K	0.6729	0.0037	325.079	1536.00	4.72501	0.02116
	0.6739	0.0027	323.543	1544.00	4.77216	0.02095
	0.6749	0.0017	321.999	1553.00	4.82300	0.02073
	0.6759	0.0007	320.446			
					δx_i avg. =	0.022
290 K	0.6659	0.0107	287.921	1646.00	5.71685	0.01749
	0.6669	0.0097	286.275	1652.00	5.77068	0.01733
	0.6679	0.0087	284.623	1658.00	5.82525	0.01717
	0.6689	0.0077	282.965	1663.00	5.87705	0.01702
	0.6699	0.0067	281.302	1671.00	5.94024	0.01683
	0.6709	0.0057	279.631	1675.00	5.99004	0.01669
	0.6719	0.0047	277.956	1681.00	6.04772	0.01654
	0.6729	0.0037	276.275	1686.00	6.10262	0.01639
	0.6739	0.0027	274.589	1691.00	6.15829	0.01624
	0.6749	0.0017	272.898	1696.00	6.21478	0.01609
	0.6759	0.0007	271.202			
					δx_i avg. =	0.017
310 K	0.6659	0.0107	238.415	1601.00	6.71518	0.01489
	0.6669	0.0097	236.814	1599.00	6.75213	0.01481
	0.6679	0.0087	235.215	1596.00	6.78528	0.01474
	0.6689	0.0077	233.619	1593.00	6.81879	0.01467
	0.6699	0.0067	232.026	1589.00	6.84837	0.01460
	0.6709	0.0057	230.437	1586.00	6.88258	0.01453
	0.6719	0.0047	228.851	1581.00	6.90843	0.01448
	0.6729	0.0037	227.270	1577.00	6.93888	0.01441
	0.6739	0.0027	225.693	1573.00	6.96964	0.01435
	0.6749	0.0017	224.120	1568.00	6.99625	0.01429
	0.6759	0.0007	222.552			
					δx_i avg. =	0.015

Table B.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6659	0.0107	196.572	1304.00	6.63370	0.01507
	0.6669	0.0097	195.268	1296.00	6.63703	0.01507
	0.6679	0.0087	193.972	1288.00	6.64013	0.01506
	0.6689	0.0077	192.684	1281.00	6.64819	0.01504
	0.6699	0.0067	191.403	1272.00	6.64566	0.01505
	0.6709	0.0057	190.131	1265.00	6.65331	0.01503
	0.6719	0.0047	188.866	1257.00	6.65551	0.01503
	0.6729	0.0037	187.609	1248.00	6.65213	0.01503
	0.6739	0.0027	186.361	1240.00	6.65375	0.01503
	0.6749	0.0017	185.121	1313.00	7.09266	0.01410
	0.6759	0.0007	183.808			
					δx_i avg. =	0.015
350 K	0.6659	0.0107	166.339	992.00	5.96372	0.01677
	0.6669	0.0097	165.347	977.00	5.90879	0.01692
	0.6679	0.0087	164.370	987.00	6.00475	0.01665
	0.6689	0.0077	163.383	971.00	5.94309	0.01683
	0.6699	0.0067	162.412	965.00	5.94168	0.01683
	0.6709	0.0057	161.447	959.00	5.94003	0.01683
	0.6719	0.0047	160.488	953.00	5.93814	0.01684
	0.6729	0.0037	159.535	945.00	5.92347	0.01688
	0.6739	0.0027	158.590	939.00	5.92093	0.01689
	0.6749	0.0017	157.651	932.00	5.91179	0.01692
	0.6759	0.0007	156.719			
					δx_i avg. =	0.017

Table B.1.1. NIST Data for the Case A Gas Mixture at 17.237 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	421.156	1124.00	2.66884	0.03747
	0.6669	0.0097	420.032	1128.00	2.68551	0.03724
	0.6679	0.0087	418.904	1133.00	2.70468	0.03697
	0.6689	0.0077	417.771	1137.00	2.72159	0.03674
	0.6699	0.0067	416.634	1143.00	2.74342	0.03645
	0.6709	0.0057	415.491	1147.00	2.76059	0.03622
	0.6719	0.0047	414.344	1152.00	2.78030	0.03597
	0.6729	0.0037	413.192	1155.00	2.79531	0.03577
	0.6739	0.0027	412.037	1162.00	2.82014	0.03546
	0.6749	0.0017	410.875	1167.00	2.84028	0.03521
	0.6759	0.0007	409.708			
					δx_i avg. =	0.036
250 K	0.6659	0.0107	389.369	1205.00	3.09475	0.03231
	0.6669	0.0097	388.164	1210.00	3.11724	0.03208
	0.6679	0.0087	386.954	1216.00	3.14249	0.03182
	0.6689	0.0077	385.738	1222.00	3.16795	0.03157
	0.6699	0.0067	384.516	1227.00	3.19102	0.03134
	0.6709	0.0057	383.289	1232.00	3.21428	0.03111
	0.6719	0.0047	382.057	1238.00	3.24035	0.03086
	0.6729	0.0037	380.819	1244.00	3.26664	0.03061
	0.6739	0.0027	379.575	1248.00	3.28789	0.03041
	0.6749	0.0017	378.327	1254.00	3.31459	0.03017
	0.6759	0.0007	377.073			
					δx_i avg. =	0.031
270 K	0.6659	0.0107	354.258	1306.00	3.68658	0.02713
	0.6669	0.0097	352.952	1317.00	3.73139	0.02680
	0.6679	0.0087	351.635	1312.00	3.73114	0.02680
	0.6689	0.0077	350.323	1324.00	3.77937	0.02646
	0.6699	0.0067	348.999	1329.00	3.80803	0.02626
	0.6709	0.0057	347.670	1335.00	3.83985	0.02604
	0.6719	0.0047	346.335	1341.00	3.87197	0.02583

Table B.1.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6729	0.0037	344.994	1348.00	3.90731	0.02559
	0.6739	0.0027	343.646	1353.00	3.93719	0.02540
	0.6749	0.0017	342.293	1359.00	3.97028	0.02519
	0.6759	0.0007	340.934			
					δx_i avg. =	0.026
290 K	0.6659	0.0107	315.999	1398.00	4.42406	0.02260
	0.6669	0.0097	314.601	1404.00	4.46280	0.02241
	0.6679	0.0087	313.197	1409.00	4.49877	0.02223
	0.6689	0.0077	311.788	1413.00	4.53193	0.02207
	0.6699	0.0067	310.375	1417.00	4.56545	0.02190
	0.6709	0.0057	308.958	1425.00	4.61228	0.02168
	0.6719	0.0047	307.533	1428.00	4.64340	0.02154
	0.6729	0.0037	306.105	1433.00	4.68140	0.02136
	0.6739	0.0027	304.672	1438.00	4.71983	0.02119
	0.6749	0.0017	303.234	1443.00	4.75870	0.02101
	0.6759	0.0007	301.791			
					δx_i avg. =	0.022
310 K	0.6659	0.0107	276.385	1419.00	5.13414	0.01948
	0.6669	0.0097	274.966	1422.00	5.17155	0.01934
	0.6679	0.0087	273.544	1423.00	5.20209	0.01922
	0.6689	0.0077	272.121	1425.00	5.23664	0.01910
	0.6699	0.0067	270.696	1426.00	5.26790	0.01898
	0.6709	0.0057	269.270	1428.00	5.30323	0.01886
	0.6719	0.0047	267.842	1429.00	5.33523	0.01874
	0.6729	0.0037	266.413	1430.00	5.36761	0.01863
	0.6739	0.0027	264.983	1432.00	5.40412	0.01850
	0.6749	0.0017	263.551	1432.00	5.43348	0.01840
	0.6759	0.0007	262.119			
					δx_i avg. =	0.019

Table B.1.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6659	0.0107	239.070	1319.00	5.51721	0.01813
	0.6669	0.0097	237.751	1317.00	5.53941	0.01805
	0.6679	0.0087	236.434	1314.00	5.55758	0.01799
	0.6689	0.0077	235.120	1312.00	5.58013	0.01792
	0.6699	0.0067	233.808	1309.00	5.59861	0.01786
	0.6709	0.0057	232.499	1307.00	5.62153	0.01779
	0.6719	0.0047	231.192	1304.00	5.64033	0.01773
	0.6729	0.0037	229.888	1301.00	5.65928	0.01767
	0.6739	0.0027	228.587	1298.00	5.67836	0.01761
	0.6749	0.0017	227.289	1295.00	5.69759	0.01755
	0.6759	0.0007	225.994			
					δx_i avg. =	0.018
350 K	0.6659	0.0107	207.451	1133.00	5.46153	0.01831
	0.6669	0.0097	206.318	1130.00	5.47698	0.01826
	0.6679	0.0087	205.188	1125.00	5.48278	0.01824
	0.6689	0.0077	204.063	1120.00	5.48850	0.01822
	0.6699	0.0067	202.943	1116.00	5.49908	0.01818
	0.6709	0.0057	201.827	1112.00	5.50967	0.01815
	0.6719	0.0047	200.715	1107.00	5.51528	0.01813
	0.6729	0.0037	199.608	1102.00	5.52082	0.01811
	0.6739	0.0027	198.506	1098.00	5.53132	0.01808
	0.6749	0.0017	197.408	1093.00	5.53676	0.01806
	0.6759	0.0007	196.315			
					δx_i avg. =	0.018

Table B.1.2. NIST Data for the Case A Gas Mixture at 20.684 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	428.515	1085.00	2.53200	0.03949
	0.6669	0.0097	427.430	1090.00	2.55013	0.03921
	0.6679	0.0087	426.340	1093.00	2.56368	0.03901
	0.6689	0.0077	425.247	1098.00	2.58203	0.03873
	0.6699	0.0067	424.149	1103.00	2.60050	0.03845
	0.6709	0.0057	423.046	1107.00	2.61674	0.03822
	0.6719	0.0047	421.939	1111.00	2.63308	0.03798
	0.6729	0.0037	420.828	1114.00	2.64716	0.03778
	0.6739	0.0027	419.714	1120.00	2.66848	0.03747
	0.6749	0.0017	418.594	1124.00	2.68518	0.03724
	0.6759	0.0007	417.470			
					δx_i avg. =	0.038
250 K	0.6659	0.0107	399.458	1143.00	2.86138	0.03495
	0.6669	0.0097	398.315	1148.00	2.88214	0.03470
	0.6679	0.0087	397.167	1153.00	2.90306	0.03445
	0.6689	0.0077	396.014	1157.00	2.92161	0.03423
	0.6699	0.0067	394.857	1162.00	2.94284	0.03398
	0.6709	0.0057	393.695	1166.00	2.96168	0.03376
	0.6719	0.0047	392.529	1171.00	2.98322	0.03352
	0.6729	0.0037	391.358	1177.00	3.00748	0.03325
	0.6739	0.0027	390.181	1180.00	3.02424	0.03307
	0.6749	0.0017	389.001	1185.00	3.04626	0.03283
	0.6759	0.0007	387.816			
					δx_i avg. =	0.034
270 K	0.6659	0.0107	368.282	1210.00	3.28553	0.03044
	0.6669	0.0097	367.072	1221.00	3.32632	0.03006
	0.6679	0.0087	365.851	1218.00	3.32922	0.03004
	0.6689	0.0077	364.633	1218.00	3.34034	0.02994
	0.6699	0.0067	363.415	1229.00	3.38181	0.02957
	0.6709	0.0057	362.186	1234.00	3.40709	0.02935
	0.6719	0.0047	360.952	1395.00	3.86478	0.02587

Table B.1.2 (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6729	0.0037	359.557	1088.00	3.02595	0.03305
	0.6739	0.0027	358.469	1249.00	3.48426	0.02870
	0.6749	0.0017	357.220	1253.00	3.50764	0.02851
	0.6759	0.0007	355.967			
					δx_i avg. =	0.030
290 K	0.6659	0.0107	335.290	1268.00	3.78180	0.02644
	0.6669	0.0097	334.022	1273.00	3.81113	0.02624
	0.6679	0.0087	332.749	1277.00	3.83773	0.02606
	0.6689	0.0077	331.472	1282.00	3.86760	0.02586
	0.6699	0.0067	330.190	1286.00	3.89473	0.02568
	0.6709	0.0057	328.904	1290.00	3.92212	0.02550
	0.6719	0.0047	327.614	1295.00	3.95282	0.02530
	0.6729	0.0037	326.319	1299.00	3.98077	0.02512
	0.6739	0.0027	325.020	1305.00	4.01514	0.02491
	0.6749	0.0017	323.715	1307.00	4.03750	0.02477
	0.6759	0.0007	322.408			
					δx_i avg. =	0.026
310 K	0.6659	0.0107	301.557	1292.00	4.28443	0.02334
	0.6669	0.0097	300.265	1295.00	4.31286	0.02319
	0.6679	0.0087	298.970	1297.00	4.33823	0.02305
	0.6689	0.0077	297.673	1300.00	4.36721	0.02290
	0.6699	0.0067	296.373	1303.00	4.39649	0.02275
	0.6709	0.0057	295.070	1306.00	4.42607	0.02259
	0.6719	0.0047	293.764	1308.00	4.45255	0.02246
	0.6729	0.0037	292.456	1310.00	4.47931	0.02232
	0.6739	0.0027	291.146	1313.00	4.50976	0.02217
	0.6749	0.0017	289.833	1316.00	4.54055	0.02202
	0.6759	0.0007	288.517			
					δx_i avg. =	0.023

Table B.1.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6659	0.0107	268.921	1254.00	4.66308	0.02145
	0.6669	0.0097	267.667	1254.00	4.68493	0.02135
	0.6679	0.0087	266.413	1255.00	4.71073	0.02123
	0.6689	0.0077	265.158	1256.00	4.73680	0.02111
	0.6699	0.0067	263.902	1255.00	4.75555	0.02103
	0.6709	0.0057	262.647	1259.00	4.79351	0.02086
	0.6719	0.0047	261.388	1256.00	4.80512	0.02081
	0.6729	0.0037	260.132	1256.00	4.82832	0.02071
	0.6739	0.0027	258.876	1256.00	4.85174	0.02061
	0.6749	0.0017	257.620	1256.00	4.87540	0.02051
	0.6759	0.0007	256.364			
					δx_i avg. =	0.021
350 K	0.6659	0.0107	239.333	1157.00	4.83427	0.02069
	0.6669	0.0097	238.176	1155.00	4.84936	0.02062
	0.6679	0.0087	237.021	1153.00	4.86455	0.02056
	0.6689	0.0077	235.868	1152.00	4.88409	0.02047
	0.6699	0.0067	234.716	1150.00	4.89954	0.02041
	0.6709	0.0057	233.566	1148.00	4.91510	0.02035
	0.6719	0.0047	232.418	1147.00	4.93507	0.02026
	0.6729	0.0037	231.271	1144.00	4.94658	0.02022
	0.6739	0.0027	230.127	1143.00	4.96682	0.02013
	0.6749	0.0017	228.984	1140.00	4.97851	0.02009
	0.6759	0.0007	227.844			
					δx_i avg. =	0.020

Table B.1.3. NIST Data for the Case A Gas Mixture at 24.132 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	435.038	1056.00	2.42737	0.04120
	0.6669	0.0097	433.982	1060.00	2.44250	0.04094
	0.6679	0.0087	432.922	1064.00	2.45772	0.04069
	0.6689	0.0077	431.858	1069.00	2.47535	0.04040
	0.6699	0.0067	430.789	1072.00	2.48846	0.04019
	0.6709	0.0057	429.717	1076.00	2.50397	0.03994
	0.6719	0.0047	428.641	1079.00	2.51726	0.03973
	0.6729	0.0037	427.562	1084.00	2.53530	0.03944
	0.6739	0.0027	426.478	1089.00	2.55347	0.03916
	0.6749	0.0017	425.389	1093.00	2.56941	0.03892
	0.6759	0.0007	424.296			
					δx_i avg. =	0.040
250 K	0.6659	0.0107	408.043	1100.00	2.69579	0.03709
	0.6669	0.0097	406.943	1103.00	2.71045	0.03689
	0.6679	0.0087	405.840	1108.00	2.73014	0.03663
	0.6689	0.0077	404.732	1112.00	2.74750	0.03640
	0.6699	0.0067	403.620	1116.00	2.76498	0.03617
	0.6709	0.0057	402.504	1121.00	2.78507	0.03591
	0.6719	0.0047	401.383	1124.00	2.80032	0.03571
	0.6729	0.0037	400.259	1129.00	2.82067	0.03545
	0.6739	0.0027	399.130	1133.00	2.83867	0.03523
	0.6749	0.0017	397.997	1138.00	2.85932	0.03497
	0.6759	0.0007	396.859			
					δx_i avg. =	0.036
270 K	0.6659	0.0107	379.627	1146.00	3.01875	0.03313
	0.6669	0.0097	378.481	1151.00	3.04110	0.03288
	0.6679	0.0087	377.330	1162.00	3.07953	0.03247
	0.6689	0.0077	376.168	1153.00	3.06512	0.03263
	0.6699	0.0067	375.015	1164.00	3.10388	0.03222
	0.6709	0.0057	373.851	1168.00	3.12424	0.03201
	0.6719	0.0047	372.683	1173.00	3.14745	0.03177

Table B.1.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270K	0.6729	0.0037	371.510	1177.00	3.16815	0.03156
	0.6739	0.0027	370.333	1182.00	3.19172	0.03133
	0.6749	0.0017	369.151	1186.00	3.21278	0.03113
	0.6759	0.0007	367.965			
					δx_i avg. =	0.032
290 K	0.6659	0.0107	350.095	1188.00	3.39336	0.02947
	0.6669	0.0097	348.907	1193.00	3.41925	0.02925
	0.6679	0.0087	347.714	1196.00	3.43961	0.02907
	0.6689	0.0077	346.518	1200.00	3.46302	0.02888
	0.6699	0.0067	345.318	1204.00	3.48664	0.02868
	0.6709	0.0057	344.114	1208.00	3.51046	0.02849
	0.6719	0.0047	342.906	1213.00	3.53741	0.02827
	0.6729	0.0037	341.693	1216.00	3.55875	0.02810
	0.6739	0.0027	340.477	1221.00	3.58615	0.02789
	0.6749	0.0017	339.256	1225.00	3.61084	0.02769
	0.6759	0.0007	338.031			
					δx_i avg. =	0.029
310 K	0.6659	0.0107	320.186	1208.00	3.77281	0.02651
	0.6669	0.0097	318.978	1211.00	3.79650	0.02634
	0.6679	0.0087	317.767	1214.00	3.82041	0.02618
	0.6689	0.0077	316.553	1217.00	3.84454	0.02601
	0.6699	0.0067	315.336	1221.00	3.87206	0.02583
	0.6709	0.0057	314.115	1223.00	3.89348	0.02568
	0.6719	0.0047	312.892	1226.00	3.91828	0.02552
	0.6729	0.0037	311.666	1229.00	3.94332	0.02536
	0.6739	0.0027	310.437	1231.00	3.96538	0.02522
	0.6749	0.0017	309.206	1235.00	3.99410	0.02504
	0.6759	0.0007	307.971			
					δx_i avg. =	0.026

Table B.1.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6659	0.0107	291.029	1191.00	4.09238	0.02444
	0.6669	0.0097	289.838	1194.00	4.11954	0.02427
	0.6679	0.0087	288.644	1195.00	4.14005	0.02415
	0.6689	0.0077	287.449	1197.00	4.16422	0.02401
	0.6699	0.0067	286.252	1198.00	4.18512	0.02389
	0.6709	0.0057	285.054	1199.00	4.20622	0.02377
	0.6719	0.0047	283.855	1199.00	4.22399	0.02367
	0.6729	0.0037	282.656	1202.00	4.25252	0.02352
	0.6739	0.0027	281.454	1204.00	4.27779	0.02338
	0.6749	0.0017	280.250	1205.00	4.29973	0.02326
	0.6759	0.0007	279.045			
					δx_i avg. =	0.024
350 K	0.6659	0.0107	263.833	1136.00	4.30575	0.02322
	0.6669	0.0097	262.697	1138.00	4.33199	0.02308
	0.6679	0.0087	261.559	1137.00	4.34701	0.02300
	0.6689	0.0077	260.422	1137.00	4.36599	0.02290
	0.6699	0.0067	259.285	1137.00	4.38514	0.02280
	0.6709	0.0057	258.148	1137.00	4.40445	0.02270
	0.6719	0.0047	257.011	1137.00	4.42394	0.02260
	0.6729	0.0037	255.874	1137.00	4.44359	0.02250
	0.6739	0.0027	254.737	1137.00	4.46343	0.02240
	0.6749	0.0017	253.600	1140.00	4.49527	0.02225
	0.6759	0.0007	252.460			
					δx_i avg. =	0.023

Table B.1.4. NIST Data for the Case A Gas Mixture at 27.579 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	440.917	1034.00	2.34511	0.04264
	0.6669	0.0097	439.883	1037.00	2.35745	0.04242
	0.6679	0.0087	438.846	1040.00	2.36985	0.04220
	0.6689	0.0077	437.806	1045.00	2.38690	0.04190
	0.6699	0.0067	436.761	1049.00	2.40177	0.04164
	0.6709	0.0057	435.712	1052.00	2.41444	0.04142
	0.6719	0.0047	434.660	1055.00	2.42718	0.04120
	0.6729	0.0037	433.605	1060.00	2.44462	0.04091
	0.6739	0.0027	432.545	1064.00	2.45986	0.04065
	0.6749	0.0017	431.481	1068.00	2.47520	0.04040
	0.6759	0.0007	430.413			
					δx_i avg. =	0.042
250 K	0.6659	0.0107	415.552	1067.00	2.56767	0.03895
	0.6669	0.0097	414.485	1070.00	2.58152	0.03874
	0.6679	0.0087	413.415	1074.00	2.59787	0.03849
	0.6689	0.0077	412.341	1078.00	2.61434	0.03825
	0.6699	0.0067	411.263	1083.00	2.63335	0.03797
	0.6709	0.0057	410.180	1086.00	2.64762	0.03777
	0.6719	0.0047	409.094	1089.00	2.66198	0.03757
	0.6729	0.0037	408.005	1094.00	2.68134	0.03729
	0.6739	0.0027	406.911	1099.00	2.70084	0.03703
	0.6749	0.0017	405.812	1102.00	2.71554	0.03683
	0.6759	0.0007	404.710			
					δx_i avg. =	0.038
270 K	0.6659	0.0107	389.213	1102.00	2.83135	0.03532
	0.6669	0.0097	388.111	1112.00	2.86516	0.03490
	0.6679	0.0087	386.999	1109.00	2.86564	0.03490
	0.6689	0.0077	385.890	1108.00	2.87128	0.03483
	0.6699	0.0067	384.782	1118.00	2.90554	0.03442
	0.6709	0.0057	383.664	1122.00	2.92443	0.03419
	0.6719	0.0047	382.542	1126.00	2.94347	0.03397

Table B.1.4. (Continued)

Isotherm	C1	C7	ρ (kg/m^3)	dρ/dx	(dρ/dx)(1/ρ)	dxi * 10^{-3} 1/(dρ/dx)(1/ρ)
290 K	0.6659	0.0107	362.173	1133.00	3.12834	0.03197
	0.6669	0.0097	361.040	1137.00	3.14924	0.03175
	0.6679	0.0087	359.903	1141.00	3.17030	0.03154
	0.6689	0.0077	358.762	1144.00	3.18874	0.03136
	0.6699	0.0067	357.618	1148.00	3.21013	0.03115
	0.6709	0.0057	356.470	1152.00	3.23169	0.03094
	0.6719	0.0047	355.318	1156.00	3.25342	0.03074
	0.6729	0.0037	354.162	1161.00	3.27816	0.03050
	0.6739	0.0027	353.001	1163.00	3.29461	0.03035
	0.6749	0.0017	351.838	1167.00	3.31687	0.03015
	0.6759	0.0007	350.671			
					δx_i avg. =	0.031
310 K	0.6659	0.0107	334.976	1149.00	3.43010	0.02915
	0.6669	0.0097	333.827	1153.00	3.45388	0.02895
	0.6669	0.0087	332.674	1156.00	3.47487	0.02878
	0.6669	0.0077	331.518	1158.00	3.49302	0.02863
	0.6699	0.0067	330.360	1163.00	3.52040	0.02841
	0.6709	0.0057	329.197	1165.00	3.53891	0.02826
	0.6719	0.0047	328.032	1168.00	3.56063	0.02808
	0.6729	0.0037	326.864	1171.00	3.58253	0.02791
	0.6739	0.0027	325.693	1175.00	3.60769	0.02772
	0.6749	0.0017	324.518	1177.00	3.62692	0.02757
	0.6759	0.0007	323.341			
					δx_i avg. =	0.028
330 K	0.6659	0.0107	308.402	1142.00	3.70296	0.02701
	0.6669	0.0097	307.260	1145.00	3.72649	0.02683
	0.6679	0.0087	306.115	1146.00	3.74369	0.02671
	0.6689	0.0077	304.969	1149.00	3.76760	0.02654
	0.6699	0.0067	303.820	1153.00	3.79501	0.02635
	0.6709	0.0057	302.667	1153.00	3.80947	0.02625
	0.6719	0.0047	301.514	1155.00	3.83067	0.02611

Table B.1.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6729	0.0037	300.359	1155.00	3.84540	0.02601
	0.6739	0.0027	299.204	1159.00	3.87361	0.02582
	0.6749	0.0017	298.045	1161.00	3.89538	0.02567
	0.6759	0.0007	296.884			
					δx_i avg. =	0.026
350 K	0.6659	0.0107	283.268	1109.00	3.91502	0.02554
	0.6669	0.0097	282.159	1110.00	3.93395	0.02542
	0.6679	0.0087	281.049	1110.00	3.94949	0.02532
	0.6689	0.0077	279.939	1112.00	3.97229	0.02517
	0.6699	0.0067	278.827	1113.00	3.99172	0.02505
	0.6709	0.0057	277.714	1114.00	4.01132	0.02493
	0.6719	0.0047	276.600	1115.00	4.03109	0.02481
	0.6729	0.0037	275.485	1116.00	4.05104	0.02469
	0.6739	0.0027	274.369	1116.00	4.06751	0.02459
	0.6749	0.0017	273.253	1118.00	4.09145	0.02444
	0.6759	0.0007	272.135			
					δx_i avg. =	0.025

Table B.1.5. NIST Data for the Case A Gas Mixture at 31.026 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	446.282	1015.00	2.27435	0.04397
	0.6669	0.0097	445.267	1018.00	2.28627	0.04374
	0.6679	0.0087	444.249	1022.00	2.30051	0.04347
	0.6689	0.0077	443.227	1026.00	2.31484	0.04320
	0.6699	0.0067	442.201	1029.00	2.32700	0.04297
	0.6709	0.0057	441.172	1033.00	2.34149	0.04271
	0.6719	0.0047	440.139	1036.00	2.35380	0.04248
	0.6729	0.0037	439.103	1040.00	2.36846	0.04222
	0.6739	0.0027	438.063	1045.00	2.38550	0.04192
	0.6749	0.0017	437.018	1048.00	2.39807	0.04170
	0.6759	0.0007	435.970			
					δx_i avg. =	0.043
250 K	0.6659	0.0107	422.249	1041.00	2.46537	0.04056
	0.6669	0.0097	421.208	1044.00	2.47859	0.04035
	0.6679	0.0087	420.164	1048.00	2.49426	0.04009
	0.6689	0.0077	419.116	1052.00	2.51004	0.03984
	0.6699	0.0067	418.064	1056.00	2.52593	0.03959
	0.6709	0.0057	417.008	1059.00	2.53952	0.03938
	0.6719	0.0047	415.949	1063.00	2.55560	0.03913
	0.6729	0.0037	414.886	1067.00	2.57179	0.03888
	0.6739	0.0027	413.819	1071.00	2.58809	0.03864
	0.6749	0.0017	412.748	1075.00	2.60449	0.03840
	0.6759	0.0007	411.673			
					δx_i avg. =	0.039
270 K	0.6659	0.0107	397.548	1068.00	2.68647	0.03722
	0.6669	0.0097	396.480	1079.00	2.72145	0.03675
	0.6679	0.0087	395.401	1075.00	2.71876	0.03678
	0.6689	0.0077	394.326	1074.00	2.72363	0.03672
	0.6699	0.0067	393.252	1083.00	2.75396	0.03631
	0.6709	0.0057	392.169	1087.00	2.77176	0.03608
	0.6719	0.0047	391.082	1092.00	2.79225	0.03581

Table B.1.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6729	0.0037	389.990	1095.00	2.80776	0.03562
	0.6739	0.0027	388.895	1098.00	2.82338	0.03542
	0.6749	0.0017	387.797	1103.00	2.84427	0.03516
	0.6759	0.0007	386.694			
					δx_i avg. =	0.032
290 K	0.6659	0.0107	372.412	1092.00	2.93224	0.03410
	0.6669	0.0097	371.320	1096.00	2.95163	0.03388
	0.6679	0.0087	370.224	1100.00	2.97117	0.03366
	0.6689	0.0077	369.124	1103.00	2.98816	0.03347
	0.6699	0.0067	368.021	1109.00	3.01341	0.03318
	0.6709	0.0057	366.912	1110.00	3.02525	0.03306
	0.6719	0.0047	365.802	1115.00	3.04810	0.03281
	0.6729	0.0037	364.687	1118.00	3.06564	0.03262
	0.6739	0.0027	363.569	1121.00	3.08332	0.03243
	0.6749	0.0017	362.448	1125.00	3.10389	0.03222
	0.6759	0.0007	361.323			
					δx_i avg. =	0.033
310 K	0.6659	0.0107	347.261	1106.00	3.18492	0.03140
	0.6669	0.0097	346.155	1110.00	3.20666	0.03119
	0.6679	0.0087	345.045	1112.00	3.22277	0.03103
	0.6689	0.0077	343.933	1116.00	3.24482	0.03082
	0.6699	0.0067	342.817	1119.00	3.26413	0.03064
	0.6709	0.0057	341.698	1121.00	3.28067	0.03048
	0.6719	0.0047	340.577	1125.00	3.30322	0.03027
	0.6729	0.0037	339.452	1129.00	3.32595	0.03007
	0.6739	0.0027	338.323	1131.00	3.34296	0.02991
	0.6749	0.0017	337.192	1135.00	3.36603	0.02971
	0.6759	0.0007	336.057			
					δx_i avg. =	0.031

Table B.1.5. (Continued)

Isotherm	C1	C7	ρ (kg/m^3)	dρ/dx	(dρ/dx)(1/ρ)	dxi * 10^{-3} 1/(dρ/dx)(1/ρ)
330 K	0.6659	0.0107	322.670	1104.00	3.42145	0.02923
	0.6679	0.0087	320.460	1108.00	3.45753	0.02892
	0.6689	0.0077	319.352	1111.00	3.47892	0.02874
	0.6699	0.0067	318.241	1114.00	3.50049	0.02857
	0.6709	0.0057	317.127	1116.00	3.51909	0.02842
	0.6719	0.0047	316.011	1119.00	3.54102	0.02824
	0.6729	0.0037	314.892	1119.00	3.55360	0.02814
	0.6739	0.0027	313.773	1123.00	3.57902	0.02794
	0.6749	0.0017	312.650	1126.00	3.60147	0.02777
	0.6759	0.0007	311.524			
					δx_i avg. =	0.029
350 K	0.6659	0.0107	299.232	1082.00	3.61592	0.02766
	0.6669	0.0097	298.150	1084.00	3.63575	0.02750
	0.6679	0.0087	297.066	1085.00	3.65239	0.02738
	0.6689	0.0077	295.981	1086.00	3.66915	0.02725
	0.6699	0.0067	294.895	1089.00	3.69284	0.02708
	0.6709	0.0057	293.806	1090.00	3.70993	0.02695
	0.6719	0.0047	292.716	1091.00	3.72716	0.02683
	0.6729	0.0037	291.625	1093.00	3.74796	0.02668
	0.6739	0.0027	290.532	1059.00	3.64504	0.02743
	0.6749	0.0017	289.473	1132.00	3.91055	0.02557
	0.6759	0.0007	288.341			
					δx_i avg. =	0.027

Table B.1.6. NIST Data for the Case A Gas Mixture at 34.474 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	451.227	1000.00	2.21618	0.04512
	0.6669	0.0097	450.227	1002.00	2.22554	0.04493
	0.6679	0.0087	449.225	1007.00	2.24164	0.04461
	0.6689	0.0077	448.218	1010.00	2.25337	0.04438
	0.6699	0.0067	447.208	1013.00	2.26517	0.04415
	0.6709	0.0057	446.195	1017.00	2.27927	0.04387
	0.6719	0.0047	445.178	1020.00	2.29122	0.04364
	0.6729	0.0037	444.158	1024.00	2.30549	0.04337
	0.6739	0.0027	443.134	1029.00	2.32210	0.04306
	0.6749	0.0017	442.105	1031.00	2.33203	0.04288
	0.6759	0.0007	441.074			
					δx_i avg. =	0.044
250 K	0.6659	0.0107	428.310	1020.00	2.38145	0.04199
	0.6669	0.0097	427.290	1024.00	2.39650	0.04173
	0.6679	0.0087	426.266	1027.00	2.40929	0.04151
	0.6689	0.0077	425.239	1031.00	2.42452	0.04125
	0.6699	0.0067	418.064	1056.00	2.52593	0.03959
	0.6709	0.0057	417.008	1059.00	2.53952	0.03938
	0.6719	0.0047	415.949	1063.00	2.55560	0.03913
	0.6729	0.0037	414.886	1067.00	2.57179	0.03888
	0.6739	0.0027	413.819	1071.00	2.58809	0.03864
	0.6749	0.0017	412.748	1075.00	2.60449	0.03840
	0.6759	0.0007	411.673			
					δx_i avg. =	0.039
270 K	0.6659	0.0107	397.548	1068.00	2.68647	0.03722
	0.6669	0.0097	396.480	1079.00	2.72145	0.03675
	0.6679	0.0087	395.401	1075.00	2.71876	0.03678
	0.6689	0.0077	394.326	1074.00	2.72363	0.03672
	0.6699	0.0067	393.252	1083.00	2.75396	0.03631
	0.6709	0.0057	392.169	1087.00	2.77176	0.03608
	0.6719	0.0047	391.082	1092.00	2.79225	0.03581

Table B.1.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6729	0.0037	389.990	1095.00	2.80776	0.03562
	0.6739	0.0027	388.895	1098.00	2.82338	0.03542
	0.6749	0.0017	387.797	1103.00	2.84427	0.03516
	0.6759	0.0007	386.694			
					δx_i avg. =	0.032
290 K	0.6659	0.0107	372.412	1092.00	2.93224	0.03410
	0.6669	0.0097	371.320	1096.00	2.95163	0.03388
	0.6679	0.0087	370.224	1100.00	2.97117	0.03366
	0.6689	0.0077	369.124	1103.00	2.98816	0.03347
	0.6699	0.0067	368.021	1109.00	3.01341	0.03318
	0.6709	0.0057	366.912	1110.00	3.02525	0.03306
	0.6719	0.0047	365.802	1115.00	3.04810	0.03281
	0.6729	0.0037	364.687	1118.00	3.06564	0.03262
	0.6739	0.0027	363.569	1121.00	3.08332	0.03243
	0.6749	0.0017	362.448	1125.00	3.10389	0.03222
	0.6759	0.0007	361.323			
					δx_i avg. =	0.033
310 K	0.6659	0.0107	347.261	1106.00	3.18492	0.03140
	0.6669	0.0097	346.155	1110.00	3.20666	0.03119
	0.6679	0.0087	345.045	1112.00	3.22277	0.03103
	0.6689	0.0077	343.933	1116.00	3.24482	0.03082
	0.6699	0.0067	342.817	1119.00	3.26413	0.03064
	0.6709	0.0057	341.698	1121.00	3.28067	0.03048
	0.6719	0.0047	340.577	1125.00	3.30322	0.03027
	0.6729	0.0037	339.452	1129.00	3.32595	0.03007
	0.6739	0.0027	338.323	1131.00	3.34296	0.02991
	0.6749	0.0017	337.192	1135.00	3.36603	0.02971
	0.6759	0.0007	336.057			
					δx_i avg. =	0.031

Table B.1.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6659	0.0107	322.670	1104.00	3.42145	0.02923
	0.6669	0.0097	321.566	1106.00	3.43942	0.02907
	0.6679	0.0087	320.460	1108.00	3.45753	0.02892
	0.6689	0.0077	319.352	1111.00	3.47892	0.02874
	0.6699	0.0067	318.241	1114.00	3.50049	0.02857
	0.6709	0.0057	317.127	1116.00	3.51909	0.02842
	0.6719	0.0047	316.011	1119.00	3.54102	0.02824
	0.6729	0.0037	314.892	1119.00	3.55360	0.02814
	0.6739	0.0027	313.773	1123.00	3.57902	0.02794
	0.6749	0.0017	312.650	1126.00	3.60147	0.02777
	0.6759	0.0007	311.524			
					δx_i avg. =	0.029
350 K	0.6659	0.0107	299.232	1082.00	3.61592	0.02766
	0.6669	0.0097	298.150	1084.00	3.63575	0.02750
	0.6679	0.0087	297.066	1085.00	3.65239	0.02738
	0.6689	0.0077	295.981	1086.00	3.66915	0.02725
	0.6699	0.0067	294.895	1089.00	3.69284	0.02708
	0.6709	0.0057	293.806	1090.00	3.70993	0.02695
	0.6719	0.0047	292.716	1091.00	3.72716	0.02683
	0.6729	0.0037	291.625	1093.00	3.74796	0.02668
	0.6739	0.0027	290.532	1059.00	3.64504	0.02743
	0.6749	0.0017	289.473	1132.00	3.91055	0.02557
	0.6759	0.0007	288.341			
					δx_i avg. =	0.027

Table B.1.7. NIST Data for the Case A Gas Mixture at 37.921 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.6659	0.0107	455.821	986.00	2.16313	0.04623
	0.6669	0.0097	454.835	990.00	2.17661	0.04594
	0.6679	0.0087	453.845	994.00	2.19018	0.04566
	0.6689	0.0077	452.851	996.00	2.19940	0.04547
	0.6699	0.0067	451.855	1001.00	2.21531	0.04514
	0.6709	0.0057	450.854	1003.00	2.22467	0.04495
	0.6719	0.0047	449.851	1006.00	2.23630	0.04472
	0.6729	0.0037	448.845	1011.00	2.25245	0.04440
	0.6739	0.0027	447.834	1015.00	2.26646	0.04412
	0.6749	0.0017	446.819	1018.00	2.27833	0.04389
	0.6759	0.0007	445.801			
					δx_i avg. =	0.045
250 K	0.6659	0.0107	433.857	1003.00	2.31182	0.04326
	0.6669	0.0097	432.854	1007.00	2.32642	0.04298
	0.6679	0.0087	431.847	1010.00	2.33879	0.04276
	0.6689	0.0077	430.837	1013.00	2.35124	0.04253
	0.6699	0.0067	429.824	1017.00	2.36608	0.04226
	0.6709	0.0057	428.807	1021.00	2.38102	0.04200
	0.6719	0.0047	427.786	1023.00	2.39138	0.04182
	0.6729	0.0037	426.763	1028.00	2.40883	0.04151
	0.6739	0.0027	425.735	1032.00	2.42404	0.04125
	0.6749	0.0017	424.703	1035.00	2.43700	0.04103
	0.6759	0.0007	423.668			
					δx_i avg. =	0.042
270 K	0.6659	0.0107	411.598	1020.00	2.47815	0.04035
	0.6669	0.0097	410.578	1018.00	2.47943	0.04033
	0.6679	0.0087	409.560	1028.00	2.51001	0.03984
	0.6689	0.0077	408.532	1031.00	2.52367	0.03962
	0.6699	0.0067	407.501	1034.00	2.53742	0.03941
	0.6709	0.0057	406.467	1039.00	2.55617	0.03912

Table B.1.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.6719	0.0047	405.428	1042.00	2.57012	0.03891
	0.6729	0.0037	404.386	1045.00	2.58416	0.03870
	0.6739	0.0027	403.341	1049.00	2.60078	0.03845
	0.6749	0.0017	402.292	1053.00	2.61750	0.03820
	0.6759	0.0007	401.239			
					δx_i avg. =	0.039
290 K	0.6659	0.0107	389.234	1036.00	2.66164	0.03757
	0.6669	0.0097	388.198	1040.00	2.67905	0.03733
	0.6679	0.0087	387.158	1043.00	2.69399	0.03712
	0.6689	0.0077	386.115	1047.00	2.71163	0.03688
	0.6699	0.0067	385.068	1050.00	2.72679	0.03667
	0.6709	0.0057	384.018	1054.00	2.74466	0.03643
	0.6719	0.0047	382.964	1057.00	2.76005	0.03623
	0.6729	0.0037	381.907	1061.00	2.77816	0.03600
	0.6739	0.0027	380.846	1064.00	2.79378	0.03579
	0.6749	0.0017	379.782	1068.00	2.81214	0.03556
	0.6759	0.0007	378.714			
					δx_i avg. =	0.037
310 K	0.6659	0.0107	367.015	1047.00	2.85274	0.03505
	0.6669	0.0097	365.968	1050.00	2.86910	0.03485
	0.6679	0.0087	364.918	1053.00	2.88558	0.03466
	0.6689	0.0077	363.865	1056.00	2.90218	0.03446
	0.6699	0.0067	362.809	1060.00	2.92165	0.03423
	0.6709	0.0057	361.749	1063.00	2.93850	0.03403
	0.6719	0.0047	360.686	1066.00	2.95548	0.03384
	0.6729	0.0037	359.620	1069.00	2.97258	0.03364
	0.6739	0.0027	358.551	1072.00	2.98981	0.03345
	0.6749	0.0017	357.479	1073.00	3.00157	0.03332
	0.6759	0.0007	356.406			
					δx_i avg. =	0.034

Table B.1.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.6659	0.0107	345.290	1048.00	3.03513	0.03295
	0.6669	0.0097	344.242	1051.00	3.05308	0.03275
	0.6679	0.0087	343.191	1053.00	3.06826	0.03259
	0.6689	0.0077	342.138	1056.00	3.08647	0.03240
	0.6699	0.0067	341.082	1059.00	3.10483	0.03221
	0.6709	0.0057	340.023	1062.00	3.12332	0.03202
	0.6719	0.0047	338.961	1065.00	3.14195	0.03183
	0.6729	0.0037	337.896	1068.00	3.16074	0.03164
	0.6739	0.0027	336.828	1069.00	3.17373	0.03151
	0.6749	0.0017	335.759	1073.00	3.19574	0.03129
	0.6759	0.0007	334.686			
					δx_i avg. =	0.032
350 K	0.6659	0.0107	324.415	1038.00	3.19961	0.03125
	0.6669	0.0097	323.377	1040.00	3.21606	0.03109
	0.6679	0.0087	322.337	1043.00	3.23574	0.03090
	0.6689	0.0077	321.294	1044.00	3.24936	0.03078
	0.6699	0.0067	320.250	1047.00	3.26932	0.03059
	0.6709	0.0057	319.203	1049.00	3.28631	0.03043
	0.6719	0.0047	318.154	1052.00	3.30657	0.03024
	0.6729	0.0037	317.102	1053.00	3.32070	0.03011
	0.6739	0.0027	316.049	1056.00	3.34125	0.02993
	0.6749	0.0017	314.993	1058.00	3.35880	0.02977
	0.6759	0.0007	313.935			
					δx_i avg. =	0.031

Table B.2. NIST Data for the Case B Gas Mixture at 13.79 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	373.387	1404.00	3.76017	0.02659
	0.7092	0.0013	374.791	1397.00	3.72741	0.02683
	0.7082	0.0023	376.188	1389.00	3.69230	0.02708
	0.7072	0.0033	377.577	1381.00	3.65753	0.02734
	0.7062	0.0043	378.958	1374.00	3.62573	0.02758
	0.7052	0.0053	380.332	1366.00	3.59160	0.02784
	0.7042	0.0063	381.698	1359.00	3.56041	0.02809
	0.7032	0.0073	383.057	1353.00	3.53211	0.02831
	0.7022	0.0083	384.410	1345.00	3.49887	0.02858
	0.7012	0.0093	385.755	1338.00	3.46852	0.02883
	0.7002	0.0103	387.093			
					δx_i avg. =	0.028
250 K	0.7102	0.0003	330.887	1600.00	4.83549	0.02068
	0.7092	0.0013	332.487	1590.00	4.78214	0.02091
	0.7082	0.0023	334.077	1580.00	4.72945	0.02114
	0.7072	0.0033	335.657	1570.00	4.67739	0.02138
	0.7062	0.0043	337.227	1561.00	4.62893	0.02160
	0.7052	0.0053	338.788	1552.00	4.58104	0.02183
	0.7042	0.0063	340.340	1542.00	4.53076	0.02207
	0.7032	0.0073	341.882	1533.00	4.48400	0.02230
	0.7022	0.0083	343.415	1524.00	4.43778	0.02253
	0.7012	0.0093	344.939	1515.00	4.39208	0.02277
	0.7002	0.0103	346.454			
					δx_i avg. =	0.022
270 K	0.7102	0.0003	281.014	1805.00	6.42317	0.01557
	0.7092	0.0013	282.819	1796.00	6.35035	0.01575
	0.7082	0.0023	284.615	1788.00	6.28217	0.01592
	0.7072	0.0033	286.403	1780.00	6.21502	0.01609
	0.7062	0.0043	288.183	1771.00	6.14540	0.01627
	0.7052	0.0053	289.954	1763.00	6.08027	0.01645

Table B.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7042	0.0063	291.717	1754.00	6.01268	0.01663
	0.7032	0.0073	293.471	1746.00	5.94948	0.01681
	0.7022	0.0083	295.217	1736.00	5.88042	0.01701
	0.7012	0.0093	296.953	1729.00	5.82247	0.01717
	0.7002	0.0103	298.682			
					δx_i avg. =	0.016
290 K	0.7102	0.0003	228.811	1748.00	7.63949	0.01309
	0.7092	0.0013	230.559	1750.00	7.59025	0.01317
	0.7082	0.0023	232.309	1754.00	7.55029	0.01324
	0.7072	0.0033	234.063	1756.00	7.50225	0.01333
	0.7062	0.0043	235.819	1759.00	7.45911	0.01341
	0.7052	0.0053	237.578	1762.00	7.41651	0.01348
	0.7042	0.0063	239.340	1763.00	7.36609	0.01358
	0.7032	0.0073	241.103	1764.00	7.31638	0.01367
	0.7022	0.0083	242.867	1766.00	7.27147	0.01375
	0.7012	0.0093	244.633	1766.00	7.21898	0.01385
	0.7002	0.0103	246.399			
					δx_i avg. =	0.013
310 K	0.7102	0.0003	185.961	1378.00	7.41016	0.01349
	0.7092	0.0013	187.339	1387.00	7.40369	0.01351
	0.7082	0.0023	188.726	1396.00	7.39697	0.01352
	0.7072	0.0033	190.122	1407.00	7.40051	0.01351
	0.7062	0.0043	191.529	1415.00	7.38792	0.01354
	0.7052	0.0053	192.944	1425.00	7.38556	0.01354
	0.7042	0.0063	194.369	1434.00	7.37772	0.01355
	0.7032	0.0073	195.803	1444.00	7.37476	0.01356
	0.7022	0.0083	197.247	1452.00	7.36133	0.01358
	0.7012	0.0093	198.699	1462.00	7.35786	0.01359
	0.7002	0.0103	200.161			
					δx_i avg. =	0.014

Table B.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	156.283	1019.00	6.52022	0.01534
	0.7092	0.0013	157.302	1028.00	6.53520	0.01530
	0.7082	0.0023	158.330	1035.00	6.53698	0.01530
	0.7072	0.0033	159.365	1044.00	6.55100	0.01526
	0.7062	0.0043	160.409	1051.00	6.55200	0.01526
	0.7052	0.0053	161.460	1059.00	6.55890	0.01525
	0.7042	0.0063	162.519	1068.00	6.57154	0.01522
	0.7032	0.0073	163.587	1075.00	6.57143	0.01522
	0.7022	0.0083	164.662	1084.00	6.58318	0.01519
	0.7012	0.0093	165.746	1093.00	6.59443	0.01516
	0.7002	0.0103	166.839			
					δx_i avg. =	0.015
350 K	0.7102	0.0003	135.982	776.00	5.70664	0.01752
	0.7092	0.0013	136.758	781.00	5.71082	0.01751
	0.7082	0.0023	137.539	790.00	5.74383	0.01741
	0.7072	0.0033	138.329	790.00	5.71102	0.01751
	0.7062	0.0043	139.119	799.00	5.74328	0.01741
	0.7052	0.0053	139.918	804.00	5.74622	0.01740
	0.7042	0.0063	140.722	811.00	5.76314	0.01735
	0.7032	0.0073	141.533	816.00	5.76544	0.01734
	0.7022	0.0083	142.349	822.00	5.77454	0.01732
	0.7012	0.0093	143.171	828.00	5.78329	0.01729
	0.7002	0.0103	143.999			
					δx_i avg. =	0.017

Table B.2.1. NIST Data for the Case B Gas Mixture at 17.237 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	384.806	1311.00	3.40691	0.02935
	0.7092	0.0013	386.117	1304.00	3.37721	0.02961
	0.7082	0.0023	387.421	1298.00	3.35036	0.02985
	0.7072	0.0033	388.719	1293.00	3.32631	0.03006
	0.7062	0.0043	390.012	1286.00	3.29733	0.03033
	0.7052	0.0053	391.298	1279.00	3.26861	0.03059
	0.7042	0.0063	392.577	1274.00	3.24522	0.03081
	0.7032	0.0073	393.851	1269.00	3.22203	0.03104
	0.7022	0.0083	395.120	1263.00	3.19650	0.03128
	0.7012	0.0093	396.383	1256.00	3.16865	0.03156
	0.7002	0.0103	397.639			
					δx_i avg. =	0.030
250 K	0.7102	0.0003	348.601	1423.00	4.08203	0.02450
	0.7092	0.0013	350.024	1416.00	4.04544	0.02472
	0.7082	0.0023	351.440	1408.00	4.00637	0.02496
	0.7072	0.0033	352.848	1403.00	3.97622	0.02515
	0.7062	0.0043	354.251	1396.00	3.94071	0.02538
	0.7052	0.0053	355.647	1389.00	3.90556	0.02560
	0.7042	0.0063	357.036	1382.00	3.87076	0.02583
	0.7032	0.0073	358.418	1375.00	3.83630	0.02607
	0.7022	0.0083	359.793	1369.00	3.80497	0.02628
	0.7012	0.0093	361.162	1363.00	3.77393	0.02650
	0.7002	0.0103	362.525			
					δx_i avg. =	0.025
270 K	0.7102	0.0003	308.658	1531.00	4.96018	0.02016
	0.7092	0.0013	310.189	1526.00	4.91958	0.02033
	0.7082	0.0023	311.715	1519.00	4.87304	0.02052
	0.7072	0.0033	313.234	1513.00	4.83025	0.02070
	0.7062	0.0043	314.747	1507.00	4.78797	0.02089
	0.7052	0.0053	316.254	1500.00	4.74302	0.02108

Table B.2.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7042	0.0063	317.754	1494.00	4.70175	0.02127
	0.7032	0.0073	319.248	1488.00	4.66095	0.02145
	0.7022	0.0083	320.736	1481.00	4.61750	0.02166
	0.7012	0.0093	322.217	1475.00	4.57766	0.02185
	0.7002	0.0103	323.692			
					δx_i avg. =	0.021
290 K	0.7102	0.0003	266.983	1555.00	5.82434	0.01717
	0.7092	0.0013	268.538	1552.00	5.77944	0.01730
	0.7082	0.0023	270.090	1550.00	5.73883	0.01743
	0.7072	0.0033	271.640	1547.00	5.69504	0.01756
	0.7062	0.0043	273.187	1545.00	5.65547	0.01768
	0.7052	0.0053	274.732	1543.00	5.61638	0.01781
	0.7042	0.0063	276.275	1539.00	5.57054	0.01795
	0.7032	0.0073	277.814	1536.00	5.52888	0.01809
	0.7022	0.0083	279.350	1534.00	5.49132	0.01821
	0.7012	0.0093	280.884	1530.00	5.44709	0.01836
	0.7002	0.0103	282.414			
					δx_i avg. =	0.018
310 K	0.7102	0.0003	228.103	1420.00	6.22526	0.01606
	0.7092	0.0013	229.523	1427.00	6.21724	0.01608
	0.7082	0.0023	230.950	1427.00	6.17883	0.01618
	0.7072	0.0033	232.377	1430.00	6.15379	0.01625
	0.7062	0.0043	233.807	1433.00	6.12899	0.01632
	0.7052	0.0053	235.240	1436.00	6.10440	0.01638
	0.7042	0.0063	236.676	1438.00	6.07582	0.01646
	0.7032	0.0073	238.114	1441.00	6.05172	0.01652
	0.7022	0.0083	239.555	1442.00	6.01949	0.01661
	0.7012	0.0093	240.997	1445.00	5.99593	0.01668
	0.7002	0.0103	242.442			
					δx_i avg. =	0.016

Table B.2.1. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	196.053	1191.00	6.07489	0.01646
	0.7092	0.0013	197.244	1197.00	6.06863	0.01648
	0.7082	0.0023	198.441	1202.00	6.05722	0.01651
	0.7072	0.0033	199.643	1208.00	6.05080	0.01653
	0.7062	0.0043	200.851	1213.00	6.03930	0.01656
	0.7052	0.0053	202.064	1218.00	6.02779	0.01659
	0.7042	0.0063	203.282	1224.00	6.02119	0.01661
	0.7032	0.0073	204.506	1229.00	6.00960	0.01664
	0.7022	0.0083	205.735	1234.00	5.99801	0.01667
	0.7012	0.0093	206.969	1240.00	5.99124	0.01669
	0.7002	0.0103	208.209			
					δx_i avg. =	0.017
350 K	0.7102	0.0003	171.497	969.00	5.65024	0.01770
	0.7092	0.0013	172.466	973.00	5.64169	0.01773
	0.7082	0.0023	173.439	979.00	5.64464	0.01772
	0.7072	0.0033	174.418	984.00	5.64162	0.01773
	0.7062	0.0043	175.402	989.00	5.63848	0.01774
	0.7052	0.0053	176.391	995.00	5.64088	0.01773
	0.7042	0.0063	177.386	999.00	5.63179	0.01776
	0.7032	0.0073	178.385	1005.00	5.63388	0.01775
	0.7022	0.0083	179.390	1010.00	5.63019	0.01776
	0.7012	0.0093	180.400	1016.00	5.63193	0.01776
	0.7002	0.0103	181.416			
					δx_i avg. =	0.018

Table B.2.2. NIST Data for the Case B Gas Mixture at 20.684 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	394.218	1248.00	3.16576	0.03159
	0.7092	0.0013	395.466	1244.00	3.14566	0.03179
	0.7082	0.0023	396.710	1238.00	3.12067	0.03204
	0.7072	0.0033	397.948	1233.00	3.09839	0.03227
	0.7062	0.0043	399.181	1228.00	3.07630	0.03251
	0.7052	0.0053	400.409	1223.00	3.05438	0.03274
	0.7042	0.0063	401.632	1216.00	3.02765	0.03303
	0.7032	0.0073	402.848	1212.00	3.00858	0.03324
	0.7022	0.0083	404.060	1207.00	2.98718	0.03348
	0.7012	0.0093	405.267	1202.00	2.96595	0.03372
	0.7002	0.0103	406.469			
					δx_i avg. =	0.033
250 K	0.7102	0.0003	361.984	1323.00	3.65486	0.02736
	0.7092	0.0013	363.307	1316.00	3.62228	0.02761
	0.7082	0.0023	364.623	1311.00	3.59549	0.02781
	0.7072	0.0033	365.934	1308.00	3.57442	0.02798
	0.7062	0.0043	367.242	1300.00	3.53990	0.02825
	0.7052	0.0053	368.542	1295.00	3.51385	0.02846
	0.7042	0.0063	369.837	1289.00	3.48532	0.02869
	0.7032	0.0073	371.126	1284.00	3.45974	0.02890
	0.7022	0.0083	372.410	1278.00	3.43170	0.02914
	0.7012	0.0093	373.688	1273.00	3.40659	0.02935
	0.7002	0.0103	374.961			
					δx_i avg. =	0.028
270 K	0.7102	0.0003	327.566	1391.00	4.24647	0.02355
	0.7092	0.0013	328.957	1385.00	4.21028	0.02375
	0.7082	0.0023	330.342	1381.00	4.18052	0.02392
	0.7072	0.0033	331.723	1375.00	4.14502	0.02413
	0.7062	0.0043	333.098	1370.00	4.11290	0.02431
	0.7052	0.0053	334.468	1365.00	4.08111	0.02450

Table B.2.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7042	0.0063	335.833	1359.00	4.04665	0.02471
	0.7032	0.0073	337.192	1355.00	4.01848	0.02489
	0.7022	0.0083	338.547	1348.00	3.98172	0.02511
	0.7012	0.0093	339.895	1344.00	3.95416	0.02529
	0.7002	0.0103	341.239			
					δx_i avg. =	0.024
290 K	0.7102	0.0003	292.169	1416.00	4.84651	0.02063
	0.7092	0.0013	293.585	1413.00	4.81292	0.02078
	0.7082	0.0023	294.998	1409.00	4.77630	0.02094
	0.7072	0.0033	296.407	1407.00	4.74685	0.02107
	0.7062	0.0043	297.814	1402.00	4.70764	0.02124
	0.7052	0.0053	299.216	1399.00	4.67555	0.02139
	0.7042	0.0063	300.615	1396.00	4.64381	0.02153
	0.7032	0.0073	302.011	1392.00	4.60910	0.02170
	0.7022	0.0083	303.403	1388.00	4.57477	0.02186
	0.7012	0.0093	304.791	1384.00	4.54082	0.02202
	0.7002	0.0103	306.175			
					δx_i avg. =	0.021
310 K	0.7102	0.0003	258.033	1363.00	5.28227	0.01893
	0.7092	0.0013	259.396	1364.00	5.25837	0.01902
	0.7082	0.0023	260.760	1363.00	5.22703	0.01913
	0.7072	0.0033	262.123	1362.00	5.19603	0.01925
	0.7062	0.0043	263.485	1363.00	5.17297	0.01933
	0.7052	0.0053	264.848	1361.00	5.13880	0.01946
	0.7042	0.0063	266.209	1361.00	5.11252	0.01956
	0.7032	0.0073	267.570	1360.00	5.08278	0.01967
	0.7022	0.0083	268.930	1359.00	5.05336	0.01979
	0.7012	0.0093	270.289	1358.00	5.02425	0.01990
	0.7002	0.0103	271.647			
					δx_i avg. =	0.019

Table B.2.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	227.548	1237.00	5.43622	0.01840
	0.7092	0.0013	228.785	1241.00	5.42431	0.01844
	0.7082	0.0023	230.026	1242.00	5.39939	0.01852
	0.7072	0.0033	231.268	1244.00	5.37904	0.01859
	0.7062	0.0043	232.512	1246.00	5.35886	0.01866
	0.7052	0.0053	233.758	1248.00	5.33885	0.01873
	0.7042	0.0063	235.006	1251.00	5.32327	0.01879
	0.7032	0.0073	236.257	1251.00	5.29508	0.01889
	0.7022	0.0083	237.508	1254.00	5.27982	0.01894
	0.7012	0.0093	238.762	1256.00	5.26047	0.01901
	0.7002	0.0103	240.018			
					δx_i avg. =	0.019
350 K	0.7102	0.0003	202.022	1079.00	5.34100	0.01872
	0.7092	0.0013	203.101	1081.00	5.32248	0.01879
	0.7082	0.0023	204.182	1085.00	5.31389	0.01882
	0.7072	0.0033	205.267	1088.00	5.30041	0.01887
	0.7062	0.0043	206.355	1092.00	5.29185	0.01890
	0.7052	0.0053	207.447	1096.00	5.28328	0.01893
	0.7042	0.0063	208.543	1098.00	5.26510	0.01899
	0.7032	0.0073	209.641	1102.00	5.25661	0.01902
	0.7022	0.0083	210.743	1105.00	5.24335	0.01907
	0.7012	0.0093	211.848	1108.00	5.23017	0.01912
	0.7002	0.0103	212.956			
					δx_i avg. =	0.019

Table B.2.3. NIST Data for the Case B Gas Mixture at 24.132 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	402.281	1205.00	2.99542	0.03338
	0.7092	0.0013	403.486	1200.00	2.97408	0.03362
	0.7082	0.0023	404.686	1195.00	2.95291	0.03386
	0.7072	0.0033	405.881	1190.00	2.93189	0.03411
	0.7062	0.0043	407.071	1186.00	2.91350	0.03432
	0.7052	0.0053	408.257	1181.00	2.89279	0.03457
	0.7042	0.0063	409.438	1175.00	2.86979	0.03485
	0.7032	0.0073	410.613	1171.00	2.85183	0.03507
	0.7022	0.0083	411.784	1167.00	2.83401	0.03529
	0.7012	0.0093	412.951	1162.00	2.81389	0.03554
	0.7002	0.0103	414.113			
					δx_i avg. =	0.034
250 K	0.7102	0.0003	372.852	1257.00	3.37131	0.02966
	0.7092	0.0013	374.109	1250.00	3.34127	0.02993
	0.7082	0.0023	375.359	1250.00	3.33015	0.03003
	0.7072	0.0033	376.609	1243.00	3.30051	0.03030
	0.7062	0.0043	377.852	1237.00	3.27377	0.03055
	0.7052	0.0053	379.089	1233.00	3.25253	0.03075
	0.7042	0.0063	380.322	1227.00	3.22621	0.03100
	0.7032	0.0073	381.549	1223.00	3.20536	0.03120
	0.7022	0.0083	382.772	1217.00	3.17944	0.03145
	0.7012	0.0093	383.989	1213.00	3.15894	0.03166
	0.7002	0.0103	385.202			
					δx_i avg. =	0.031
270 K	0.7102	0.0003	342.052	1304.00	3.81229	0.02623
	0.7092	0.0013	343.356	1300.00	3.78616	0.02641
	0.7082	0.0023	344.656	1295.00	3.75737	0.02661
	0.7072	0.0033	345.951	1291.00	3.73174	0.02680
	0.7062	0.0043	347.242	1285.00	3.70059	0.02702
	0.7052	0.0053	348.527	1281.00	3.67547	0.02721
	0.7042	0.0063	349.808	1276.00	3.64772	0.02741

Table B.2.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7032	0.0073	351.084	1272.00	3.62306	0.02760
	0.7022	0.0083	352.356	1266.00	3.59296	0.02783
	0.7012	0.0093	353.622	1262.00	3.56878	0.02802
	0.7002	0.0103	354.884			
					δx_i avg. =	0.027
290 K	0.7102	0.0003	310.724	1325.00	4.26423	0.02345
	0.7092	0.0013	312.049	1322.00	4.23651	0.02360
	0.7082	0.0023	313.371	1318.00	4.20588	0.02378
	0.7072	0.0033	314.689	1314.00	4.17555	0.02395
	0.7062	0.0043	316.003	1311.00	4.14869	0.02410
	0.7052	0.0053	317.314	1307.00	4.11895	0.02428
	0.7042	0.0063	318.621	1304.00	4.09264	0.02443
	0.7032	0.0073	319.925	1300.00	4.06345	0.02461
	0.7022	0.0083	321.225	1295.00	4.03144	0.02481
	0.7012	0.0093	322.520	1292.00	4.00595	0.02496
	0.7002	0.0103	323.812			
					δx_i avg. =	0.024
310 K	0.7102	0.0003	280.221	1301.00	4.64276	0.02154
	0.7092	0.0013	281.522	1300.00	4.61776	0.02166
	0.7082	0.0023	282.822	1296.00	4.58239	0.02182
	0.7072	0.0033	284.118	1296.00	4.56149	0.02192
	0.7062	0.0043	285.414	1294.00	4.53376	0.02206
	0.7052	0.0053	286.708	1292.00	4.50633	0.02219
	0.7042	0.0063	288.000	1290.00	4.47917	0.02233
	0.7032	0.0073	289.290	1288.00	4.45228	0.02246
	0.7022	0.0083	290.578	1286.00	4.42566	0.02260
	0.7012	0.0093	291.864	1284.00	4.39931	0.02273
	0.7002	0.0103	293.148			
					δx_i avg. =	0.022

Table B.2.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	252.015	1228.00	4.87273	0.02052
	0.7092	0.0013	253.243	1228.00	4.84910	0.02062
	0.7082	0.0023	254.471	1229.00	4.82963	0.02071
	0.7072	0.0033	255.700	1229.00	4.80641	0.02081
	0.7062	0.0043	256.929	1229.00	4.78342	0.02091
	0.7052	0.0053	258.158	1229.00	4.76065	0.02101
	0.7042	0.0063	259.387	1228.00	4.73424	0.02112
	0.7032	0.0073	260.615	1229.00	4.71577	0.02121
	0.7022	0.0083	261.844	1229.00	4.69363	0.02131
	0.7012	0.0093	263.073	1228.00	4.66791	0.02142
	0.7002	0.0103	264.301			
					δx_i avg. =	0.021
350 K	0.7102	0.0003	227.150	1122.00	4.93947	0.02025
	0.7092	0.0013	228.272	1123.00	4.91957	0.02033
	0.7082	0.0023	229.395	1125.00	4.90420	0.02039
	0.7072	0.0033	230.520	1127.00	4.88895	0.02045
	0.7062	0.0043	231.647	1128.00	4.86948	0.02054
	0.7052	0.0053	232.775	1130.00	4.85447	0.02060
	0.7042	0.0063	233.905	1131.00	4.83530	0.02068
	0.7032	0.0073	235.036	1132.00	4.81628	0.02076
	0.7022	0.0083	236.168	1133.00	4.79743	0.02084
	0.7012	0.0093	237.301	1135.00	4.78295	0.02091
	0.7002	0.0103	238.436			
					δx_i avg. =	0.021

Table B.2.4. NIST Data for the Case B Gas Mixture at 27.579 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	409.368	1172.00	2.86295	0.03493
	0.7092	0.0013	410.540	1167.00	2.84260	0.03518
	0.7082	0.0023	411.707	1163.00	2.82482	0.03540
	0.7072	0.0033	412.870	1158.00	2.80476	0.03565
	0.7062	0.0043	414.028	1154.00	2.78725	0.03588
	0.7052	0.0053	415.182	1149.00	2.76746	0.03613
	0.7042	0.0063	416.331	1144.00	2.74781	0.03639
	0.7032	0.0073	417.475	1140.00	2.73070	0.03662
	0.7022	0.0083	418.615	1136.00	2.71371	0.03685
	0.7012	0.0093	419.751	1131.00	2.69445	0.03711
	0.7002	0.0103	420.882			
					δx_i avg. =	0.036
250 K	0.7102	0.0003	382.059	1210.00	3.16705	0.03158
	0.7092	0.0013	383.269	1204.00	3.14140	0.03183
	0.7082	0.0023	384.473	1201.00	3.12376	0.03201
	0.7072	0.0033	385.674	1200.00	3.11144	0.03214
	0.7062	0.0043	386.874	1193.00	3.08369	0.03243
	0.7052	0.0053	388.067	1187.00	3.05875	0.03269
	0.7042	0.0063	389.254	1183.00	3.03915	0.03290
	0.7032	0.0073	390.437	1179.00	3.01969	0.03312
	0.7022	0.0083	391.616	1174.00	2.99783	0.03336
	0.7012	0.0093	392.790	1170.00	2.97869	0.03357
	0.7002	0.0103	393.960			
					δx_i avg. =	0.033
270 K	0.7102	0.0003	353.862	1245.00	3.51832	0.02842
	0.7092	0.0013	355.107	1241.00	3.49472	0.02861
	0.7082	0.0023	356.348	1237.00	3.47133	0.02881
	0.7072	0.0033	357.585	1232.00	3.44533	0.02902
	0.7062	0.0043	358.817	1228.00	3.42236	0.02922
	0.7052	0.0053	360.045	1224.00	3.39958	0.02942
	0.7042	0.0063	361.269	1218.00	3.37145	0.02966

Table B.2.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7032	0.0073	362.487	1215.00	3.35184	0.02983
	0.7022	0.0083	363.702	1210.00	3.32690	0.03006
	0.7012	0.0093	364.912	1206.00	3.30491	0.03026
	0.7002	0.0103	366.118			
					δx_i avg. =	0.026
290 K	0.7102	0.0003	325.409	1262.00	3.87820	0.02579
	0.7092	0.0013	326.671	1259.00	3.85403	0.02595
	0.7082	0.0023	327.930	1255.00	3.82704	0.02613
	0.7072	0.0033	329.185	1251.00	3.80029	0.02631
	0.7062	0.0043	330.436	1248.00	3.77683	0.02648
	0.7052	0.0053	331.684	1244.00	3.75056	0.02666
	0.7042	0.0063	332.928	1240.00	3.72453	0.02685
	0.7032	0.0073	334.168	1237.00	3.70173	0.02701
	0.7022	0.0083	335.405	1232.00	3.67317	0.02722
	0.7012	0.0093	336.637	1229.00	3.65082	0.02739
	0.7002	0.0103	337.866			
					δx_i avg. =	0.027
310 K	0.7102	0.0003	297.622	1250.00	4.19996	0.02381
	0.7092	0.0013	298.872	1246.00	4.16901	0.02399
	0.7082	0.0023	300.118	1246.00	4.15170	0.02409
	0.7082	0.0033	301.364	1243.00	4.12458	0.02424
	0.7062	0.0043	302.607	1241.00	4.10103	0.02438
	0.7052	0.0053	303.848	1238.00	4.07441	0.02454
	0.7042	0.0063	305.086	1234.00	4.04476	0.02472
	0.7032	0.0073	306.320	1233.00	4.02520	0.02484
	0.7022	0.0083	307.553	1230.00	3.99931	0.02500
	0.7012	0.0093	308.783	1227.00	3.97366	0.02517
	0.7002	0.0103	310.010			
					δx_i avg. =	0.024

Table B.2.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	271.489	1204.00	4.43480	0.02255
	0.7092	0.0013	272.693	1204.00	4.41522	0.02265
	0.7082	0.0023	273.897	1202.00	4.38851	0.02279
	0.7072	0.0033	275.099	1202.00	4.36934	0.02289
	0.7062	0.0043	276.301	1200.00	4.34309	0.02303
	0.7052	0.0053	277.501	1200.00	4.32431	0.02313
	0.7042	0.0063	278.701	1197.00	4.29493	0.02328
	0.7032	0.0073	279.898	1197.00	4.27656	0.02338
	0.7022	0.0083	281.095	1196.00	4.25479	0.02350
	0.7012	0.0093	282.291	1194.00	4.22968	0.02364
	0.7002	0.0103	283.485			
					δx_i avg. =	0.023
	0.7092	0.0013	248.910	1133.00	4.55185	0.02197
	0.7082	0.0023	250.043	1132.00	4.52722	0.02209
	0.7072	0.0033	251.175	1133.00	4.51080	0.02217
	0.7062	0.0043	252.308	1133.00	4.49054	0.02227
	0.7052	0.0053	253.441	1133.00	4.47047	0.02237
	0.7042	0.0063	254.574	1133.00	4.45057	0.02247
	0.7032	0.0073	255.707	1133.00	4.43085	0.02257
	0.7022	0.0083	256.840	1133.00	4.41131	0.02267
	0.7012	0.0093	257.973	1133.00	4.39193	0.02277
	0.7002	0.0103	259.106			
					δx_i avg. =	0.022

Table B.2.5. NIST Data for the Case B Gas Mixture at 31.026 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	415.713	1146.00	2.75671	0.03628
	0.7092	0.0013	416.859	1142.00	2.73954	0.03650
	0.7082	0.0023	418.001	1137.00	2.72009	0.03676
	0.7072	0.0033	419.138	1133.00	2.70317	0.03699
	0.7062	0.0043	420.271	1128.00	2.68398	0.03726
	0.7052	0.0053	421.399	1124.00	2.66731	0.03749
	0.7042	0.0063	422.523	1119.00	2.64838	0.03776
	0.7032	0.0073	423.642	1116.00	2.63430	0.03796
	0.7022	0.0083	424.758	1111.00	2.61561	0.03823
	0.7012	0.0093	425.869	1108.00	2.60174	0.03844
	0.7002	0.0103	426.977			
					δx_i avg. =	0.037
250 K	0.7102	0.0003	390.079	1176.00	3.01477	0.03317
	0.7092	0.0013	391.255	1168.00	2.98527	0.03350
	0.7082	0.0023	392.423	1167.00	2.97383	0.03363
	0.7072	0.0033	393.590	1166.00	2.96247	0.03376
	0.7062	0.0043	394.756	1158.00	2.93346	0.03409
	0.7052	0.0053	395.914	1154.00	2.91477	0.03431
	0.7042	0.0063	397.068	1150.00	2.89623	0.03453
	0.7032	0.0073	398.218	1145.00	2.87531	0.03478
	0.7022	0.0083	399.363	1141.00	2.85705	0.03500
	0.7012	0.0093	400.504	1137.00	2.83892	0.03522
	0.7002	0.0103	401.641			
					δx_i avg. =	0.034
270 K	0.7102	0.0003	363.872	1203.00	3.30611	0.03025
	0.7092	0.0013	365.075	1198.00	3.28152	0.03047
	0.7082	0.0023	366.273	1193.00	3.25713	0.03070
	0.7072	0.0033	367.466	1190.00	3.23839	0.03088
	0.7062	0.0043	368.656	1185.00	3.21438	0.03111
	0.7052	0.0053	369.841	1181.00	3.19326	0.03132

Table B.2.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7042	0.0063	371.022	1178.00	3.17501	0.03150
	0.7032	0.0073	372.200	1173.00	3.15153	0.03173
	0.7022	0.0083	373.373	1168.00	3.12824	0.03197
	0.7012	0.0093	374.541	1165.00	3.11047	0.03215
	0.7002	0.0103	375.706			
					δx_i avg. =	0.031
290 K	0.7102	0.0003	337.583	1216.00	3.60208	0.02776
	0.7092	0.0013	338.799	1211.00	3.57439	0.02798
	0.7082	0.0023	340.010	1209.00	3.55578	0.02812
	0.7072	0.0033	341.219	1205.00	3.53146	0.02832
	0.7062	0.0043	342.424	1201.00	3.50735	0.02851
	0.7052	0.0053	343.625	1198.00	3.48636	0.02868
	0.7042	0.0063	344.823	1194.00	3.46265	0.02888
	0.7032	0.0073	346.017	1190.00	3.43914	0.02908
	0.7022	0.0083	347.207	1187.00	3.41871	0.02925
	0.7012	0.0093	348.394	1183.00	3.39558	0.02945
	0.7002	0.0103	349.577			
					δx_i avg. =	0.029
310 K	0.7102	0.0003	311.885	1210.00	3.87964	0.02578
	0.7092	0.0013	313.095	1205.00	3.84867	0.02598
	0.7082	0.0023	314.300	1204.00	3.83073	0.02610
	0.7072	0.0033	315.504	1203.00	3.81295	0.02623
	0.7062	0.0043	316.707	1198.00	3.78268	0.02644
	0.7052	0.0053	317.905	1195.00	3.75898	0.02660
	0.7042	0.0063	319.100	1193.00	3.73864	0.02675
	0.7032	0.0073	320.293	1189.00	3.71223	0.02694
	0.7022	0.0083	321.482	1187.00	3.69228	0.02708
	0.7012	0.0093	322.669	1183.00	3.66630	0.02728
	0.7002	0.0103	323.852			
					δx_i avg. =	0.027

Table B.2.5. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	287.492	1179.00	4.10098	0.02438
	0.7092	0.0013	288.671	1177.00	4.07731	0.02453
	0.7082	0.0023	289.848	1176.00	4.05730	0.02465
	0.7072	0.0033	291.024	1174.00	4.03403	0.02479
	0.7062	0.0043	292.198	1173.00	4.01440	0.02491
	0.7052	0.0053	293.371	1170.00	3.98812	0.02507
	0.7042	0.0063	294.541	1169.00	3.96889	0.02520
	0.7032	0.0073	295.710	1166.00	3.94305	0.02536
	0.7022	0.0083	296.876	1165.00	3.92420	0.02548
	0.7012	0.0093	298.041	1162.00	3.89879	0.02565
	0.7002	0.0103	299.203			
					δx_i avg. =	0.025
350 K	0.7102	0.0003	264.976	1130.00	4.26454	0.02345
	0.7092	0.0013	266.106	1128.00	4.23891	0.02359
	0.7082	0.0023	267.234	1127.00	4.21728	0.02371
	0.7072	0.0033	268.361	1126.00	4.19584	0.02383
	0.7062	0.0043	269.487	1125.00	4.17460	0.02395
	0.7052	0.0053	270.612	1125.00	4.15724	0.02405
	0.7042	0.0063	271.737	1123.00	4.13267	0.02420
	0.7032	0.0073	272.860	1123.00	4.11566	0.02430
	0.7022	0.0083	273.983	1121.00	4.09149	0.02444
	0.7012	0.0093	275.104	1121.00	4.07482	0.02454
	0.7002	0.0103	276.225			
					δx_i avg. =	0.024

Table B.2.6. NIST Data for the Case B Gas Mixture at 34.474 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	421.473	1125.00	2.66921	0.03746
	0.7092	0.0013	422.598	1120.00	2.65027	0.03773
	0.7082	0.0023	423.718	1117.00	2.63619	0.03793
	0.7072	0.0033	424.835	1112.00	2.61749	0.03820
	0.7062	0.0043	425.947	1108.00	2.60126	0.03844
	0.7052	0.0053	427.055	1104.00	2.58515	0.03868
	0.7042	0.0063	428.159	1099.00	2.56680	0.03896
	0.7032	0.0073	429.258	1096.00	2.55324	0.03917
	0.7022	0.0083	430.354	1092.00	2.53745	0.03941
	0.7012	0.0093	431.446	1087.00	2.51943	0.03969
	0.7002	0.0103	432.533			
					δx_i avg. =	0.039
250 K	0.7102	0.0003	397.207	1149.00	2.89270	0.03457
	0.7092	0.0013	398.356	1144.00	2.87180	0.03482
	0.7082	0.0023	399.500	1136.00	2.84355	0.03517
	0.7072	0.0033	400.636	1136.00	2.83549	0.03527
	0.7062	0.0043	401.772	1135.00	2.82499	0.03540
	0.7052	0.0053	402.907	1127.00	2.79717	0.03575
	0.7042	0.0063	404.034	1123.00	2.77947	0.03598
	0.7032	0.0073	405.157	1119.00	2.76189	0.03621
	0.7022	0.0083	406.276	1115.00	2.74444	0.03644
	0.7012	0.0093	407.391	1111.00	2.72711	0.03667
	0.7002	0.0103	408.502			
					δx_i avg. =	0.036
270 K	0.7102	0.0003	372.586	1169.00	3.13753	0.03187
	0.7092	0.0013	373.755	1165.00	3.11702	0.03208
	0.7082	0.0023	374.920	1161.00	3.09666	0.03229
	0.7072	0.0033	376.081	1157.00	3.07646	0.03250
	0.7062	0.0043	377.238	1153.00	3.05643	0.03272
	0.7052	0.0053	378.391	1148.00	3.03390	0.03296

Table B.2.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7042	0.0063	379.539	1145.00	3.01682	0.03315
	0.7032	0.0073	380.684	1141.00	2.99724	0.03336
	0.7022	0.0083	381.825	1136.00	2.97518	0.03361
	0.7012	0.0093	382.961	1133.00	2.95853	0.03380
	0.7002	0.0103	384.094			
					δx_i avg. =	0.033
290 K	0.7102	0.0003	347.998	1180.00	3.39082	0.02949
	0.7092	0.0013	349.178	1177.00	3.37077	0.02967
	0.7082	0.0023	350.355	1173.00	3.34803	0.02987
	0.7072	0.0033	351.528	1170.00	3.32833	0.03005
	0.7062	0.0043	352.698	1166.00	3.30594	0.03025
	0.7052	0.0053	353.864	1162.00	3.28375	0.03045
	0.7042	0.0063	355.026	1159.00	3.26455	0.03063
	0.7032	0.0073	356.185	1155.00	3.24270	0.03084
	0.7022	0.0083	357.340	1151.00	3.22102	0.03105
	0.7012	0.0093	358.491	1147.00	3.19952	0.03125
	0.7002	0.0103	359.638			
					δx_i avg. =	0.030
310 K	0.7102	0.0003	323.961	1177.00	3.63315	0.02752
	0.7092	0.0013	325.138	1174.00	3.61077	0.02769
	0.7082	0.0023	326.312	1172.00	3.59165	0.02784
	0.7072	0.0033	327.484	1168.00	3.56659	0.02804
	0.7062	0.0043	328.652	1166.00	3.54783	0.02819
	0.7052	0.0053	329.818	1162.00	3.52316	0.02838
	0.7042	0.0063	330.980	1159.00	3.50172	0.02856
	0.7032	0.0073	332.139	1155.00	3.47746	0.02876
	0.7022	0.0083	333.294	1153.00	3.45941	0.02891
	0.7012	0.0093	334.447	1150.00	3.43851	0.02908
	0.7002	0.0103	335.597			
					δx_i avg. =	0.028

Table B.2.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	301.015	1156.00	3.84034	0.02604
	0.7092	0.0013	302.171	1154.00	3.81903	0.02618
	0.7082	0.0023	303.325	1152.00	3.79791	0.02633
	0.7072	0.0033	304.477	1149.00	3.77368	0.02650
	0.7062	0.0043	305.626	1148.00	3.75622	0.02662
	0.7052	0.0053	306.774	1145.00	3.73239	0.02679
	0.7042	0.0063	307.919	1143.00	3.71202	0.02694
	0.7032	0.0073	309.062	1140.00	3.68858	0.02711
	0.7022	0.0083	310.202	1138.00	3.66858	0.02726
	0.7012	0.0093	311.340	1136.00	3.64874	0.02741
	0.7002	0.0103	312.476			
					δx_i avg. =	0.027
350 K	0.7102	0.0003	279.604	1120.00	4.00567	0.02496
	0.7092	0.0013	280.724	1117.00	3.97900	0.02513
	0.7082	0.0023	281.841	1117.00	3.96323	0.02523
	0.7072	0.0033	282.958	1115.00	3.94051	0.02538
	0.7062	0.0043	284.073	1113.00	3.91801	0.02552
	0.7052	0.0053	285.186	1112.00	3.89921	0.02565
	0.7042	0.0063	286.298	1111.00	3.88057	0.02577
	0.7032	0.0073	287.409	1108.00	3.85513	0.02594
	0.7022	0.0083	288.517	1108.00	3.84033	0.02604
	0.7012	0.0093	289.625	1105.00	3.81528	0.02621
	0.7002	0.0103	290.730			
					δx_i avg. =	0.026

Table B.2.7. NIST Data for the Case B Gas Mixture at 37.921 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.7102	0.0003	426.757	1107.00	2.59398	0.03855
	0.7092	0.0013	427.864	1104.00	2.58026	0.03876
	0.7082	0.0023	428.968	1099.00	2.56196	0.03903
	0.7072	0.0033	430.067	1096.00	2.54844	0.03924
	0.7062	0.0043	431.163	1091.00	2.53037	0.03952
	0.7052	0.0053	432.254	1087.00	2.51473	0.03977
	0.7042	0.0063	433.341	1083.00	2.49919	0.04001
	0.7032	0.0073	434.424	1079.00	2.48375	0.04026
	0.7022	0.0083	435.503	1075.00	2.46841	0.04051
	0.7012	0.0093	436.578	1072.00	2.45546	0.04073
	0.7002	0.0103	437.650			
					δx_i avg. =	0.040
250 K	0.7102	0.0003	403.637	1127.00	2.79211	0.03582
	0.7092	0.0013	404.764	1122.00	2.77199	0.03608
	0.7082	0.0023	405.886	1141.00	2.81113	0.03557
	0.7072	0.0033	407.027	1087.00	2.67058	0.03744
	0.7062	0.0043	408.114	1109.00	2.71738	0.03680
	0.7052	0.0053	409.223	1110.00	2.71246	0.03687
	0.7042	0.0063	410.333	1102.00	2.68562	0.03724
	0.7032	0.0073	411.435	1098.00	2.66871	0.03747
	0.7022	0.0083	412.533	1093.00	2.64949	0.03774
	0.7012	0.0093	413.626	1090.00	2.63523	0.03795
	0.7002	0.0103	414.716			
					δx_i avg. =	0.037
270 K	0.7102	0.0003	380.318	1143.00	3.00538	0.03327
	0.7092	0.0013	381.461	1139.00	2.98589	0.03349
	0.7082	0.0023	382.600	1135.00	2.96654	0.03371
	0.7072	0.0033	383.735	1130.00	2.94474	0.03396
	0.7062	0.0043	384.865	1127.00	2.92830	0.03415
	0.7052	0.0053	385.992	1123.00	2.90939	0.03437
	0.7042	0.0063	387.115	1119.00	2.89061	0.03459

Table B.2.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.7032	0.0073	388.234	1115.00	2.87198	0.03482
	0.7022	0.0083	389.349	1111.00	2.85348	0.03504
	0.7012	0.0093	390.460	1108.00	2.83768	0.03524
	0.7002	0.0103	391.568			
					δx_i avg. =	0.034
290 K	0.7102	0.0003	357.115	1152.00	3.22585	0.03100
	0.7092	0.0013	358.267	1149.00	3.20711	0.03118
	0.7082	0.0023	359.416	1145.00	3.18572	0.03139
	0.7072	0.0033	360.561	1142.00	3.16729	0.03157
	0.7062	0.0043	361.703	1138.00	3.14623	0.03178
	0.7052	0.0053	362.841	1134.00	3.12534	0.03200
	0.7042	0.0063	363.975	1130.00	3.10461	0.03221
	0.7032	0.0073	365.105	1127.00	3.08678	0.03240
	0.7022	0.0083	366.232	1123.00	3.06636	0.03261
	0.7012	0.0093	367.355	1120.00	3.04882	0.03280
	0.7002	0.0103	368.475			
					δx_i avg. =	0.032
310 K	0.7102	0.0003	334.435	1150.00	3.43864	0.02908
	0.7092	0.0013	335.585	1149.00	3.42387	0.02921
	0.7082	0.0023	336.734	1145.00	3.40031	0.02941
	0.7072	0.0033	337.879	1142.00	3.37991	0.02959
	0.7062	0.0043	339.021	1138.00	3.35672	0.02979
	0.7052	0.0053	340.159	1136.00	3.33961	0.02994
	0.7042	0.0063	341.295	1132.00	3.31678	0.03015
	0.7032	0.0073	342.427	1128.00	3.29413	0.03036
	0.7022	0.0083	343.555	1126.00	3.27750	0.03051
	0.7012	0.0093	344.681	1122.00	3.25518	0.03072
	0.7002	0.0103	345.803			
					δx_i avg. =	0.030

Table B.2.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.7102	0.0003	312.704	1136.00	3.63283	0.02753
	0.7092	0.0013	313.840	1133.00	3.61012	0.02770
	0.7082	0.0023	314.973	1131.00	3.59078	0.02785
	0.7072	0.0033	316.104	1129.00	3.57161	0.02800
	0.7062	0.0043	317.233	1126.00	3.54944	0.02817
	0.7052	0.0053	318.359	1123.00	3.52746	0.02835
	0.7042	0.0063	319.482	1121.00	3.50880	0.02850
	0.7032	0.0073	320.603	1118.00	3.48718	0.02868
	0.7022	0.0083	321.721	1115.00	3.46574	0.02885
	0.7012	0.0093	322.836	1113.00	3.44757	0.02901
	0.7002	0.0103	323.949			
					δx_i avg. =	0.028
350 K	0.7102	0.0003	292.276	1108.00	3.79094	0.02638
	0.7092	0.0013	293.384	1106.00	3.76980	0.02653
	0.7082	0.0023	294.490	1105.00	3.75225	0.02665
	0.7072	0.0033	295.595	1103.00	3.73146	0.02680
	0.7062	0.0043	296.698	1101.00	3.71084	0.02695
	0.7052	0.0053	297.799	1098.00	3.68705	0.02712
	0.7042	0.0063	298.897	1097.00	3.67016	0.02725
	0.7032	0.0073	299.994	1095.00	3.65007	0.02740
	0.7022	0.0083	301.089	1093.00	3.63016	0.02755
	0.7012	0.0093	302.182	1090.00	3.60710	0.02772
	0.7002	0.0103	303.272			
					δx_i avg. =	0.027

Table B.3. NIST Data for the Case C Gas Mixture at 13.790 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	277.746	1969.00	7.08921	0.01411
	0.8933	0.001	279.715	1957.00	6.99641	0.01429
	0.8943	0.002	281.672	1946.00	6.90874	0.01447
	0.8953	0.003	283.618	1934.00	6.81903	0.01466
	0.8963	0.004	285.552	1923.00	6.73433	0.01485
	0.8973	0.005	287.475	1911.00	6.64753	0.01504
	0.8983	0.006	289.386	1899.00	6.56217	0.01524
	0.8993	0.007	291.285	1888.00	6.48162	0.01543
	0.9003	0.008	293.173	1875.00	6.39554	0.01564
	0.9013	0.009	295.048	1864.00	6.31762	0.01583
	0.9023	0.01	296.912			
					δx_i avg. =	0.015
250 K	0.8923	0	222.799	1998.00	8.96772	0.01115
	0.8933	0.001	224.797	2000.00	8.89692	0.01124
	0.8943	0.002	226.797	2002.00	8.82728	0.01133
	0.8953	0.003	228.799	2003.00	8.75441	0.01142
	0.8963	0.004	230.802	2003.00	8.67843	0.01152
	0.8973	0.005	232.805	2004.00	8.60806	0.01162
	0.8983	0.006	234.809	2003.00	8.53034	0.01172
	0.8993	0.007	236.812	2002.00	8.45396	0.01183
	0.9003	0.008	238.814	2001.00	8.37891	0.01193
	0.9013	0.009	240.815	1998.00	8.29683	0.01205
	0.9023	0.01	242.813			
					δx_i avg. =	0.012
270 K	0.8923	0	176.051	1567.00	8.90083	0.01123
	0.8933	0.001	177.618	1580.00	8.89549	0.01124
	0.8943	0.002	179.198	1591.00	8.87845	0.01126
	0.8953	0.003	180.789	1604.00	8.87222	0.01127
	0.8963	0.004	182.393	1617.00	8.86547	0.01128
	0.8973	0.005	184.010	1628.00	8.84735	0.01130
	0.8983	0.006	185.638	1641.00	8.83978	0.01131

Table B.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8993	0.007	187.279	1652.00	8.82106	0.01134
	0.9003	0.008	188.931	1664.00	8.80745	0.01135
	0.9013	0.009	190.595	1675.00	8.78827	0.01138
	0.9023	0.01	192.270			
					δx_i avg. =	0.011
290 K	0.8923	0	144.681	1122.00	7.75499	0.01289
	0.8933	0.001	145.803	1131.00	7.75704	0.01289
	0.8943	0.002	146.934	1142.00	7.77220	0.01287
	0.8953	0.003	148.076	1152.00	7.77979	0.01285
	0.8963	0.004	149.228	1162.00	7.78674	0.01284
	0.8973	0.005	150.390	1173.00	7.79972	0.01282
	0.8983	0.006	151.563	1183.00	7.80534	0.01281
	0.8993	0.007	152.746	1194.00	7.81690	0.01279
	0.9003	0.008	153.940	1204.00	7.82123	0.01279
	0.9013	0.009	155.144	1214.00	7.82499	0.01278
	0.9023	0.01	156.358			
					δx_i avg. =	0.013
310 K	0.8923	0	124.137	828.00	6.67005	0.01499
	0.8933	0.001	124.965	836.00	6.68987	0.01495
	0.8943	0.002	125.801	844.00	6.70901	0.01491
	0.8953	0.003	126.645	848.00	6.69588	0.01493
	0.8963	0.004	127.493	859.00	6.73762	0.01484
	0.8973	0.005	128.352	866.00	6.74707	0.01482
	0.8983	0.006	129.218	873.00	6.75602	0.01480
	0.8993	0.007	130.091	881.00	6.77218	0.01477
	0.9003	0.008	130.972	887.00	6.77244	0.01477
	0.9013	0.009	131.859	896.00	6.79514	0.01472
	0.9023	0.01	132.755			
					δx_i avg. =	0.015

Table B.3.1. NIST Data for the Case C Gas Mixture at 17.237 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	300.315	1704.00	5.67404	0.01762
	0.8933	0.001	302.019	1697.00	5.61885	0.01780
	0.8943	0.002	303.716	1688.00	5.55782	0.01799
	0.8953	0.003	305.404	1680.00	5.50091	0.01818
	0.8963	0.004	307.084	1673.00	5.44802	0.01836
	0.8973	0.005	308.757	1664.00	5.38935	0.01856
	0.8983	0.006	310.421	1656.00	5.33469	0.01875
	0.8993	0.007	312.077	1648.00	5.28075	0.01894
	0.9003	0.008	313.725	1639.00	5.22432	0.01914
	0.9013	0.009	315.364	1632.00	5.17497	0.01932
	0.9023	0.01	316.996			
					δx_i avg. =	0.018
250 K	0.8923	0	256.962	1758.00	6.84148	0.01462
	0.8933	0.001	258.720	1754.00	6.77953	0.01475
	0.8943	0.002	260.474	1752.00	6.72620	0.01487
	0.8953	0.003	262.226	1747.00	6.66219	0.01501
	0.8963	0.004	263.973	1743.00	6.60295	0.01514
	0.8973	0.005	265.716	1739.00	6.54458	0.01528
	0.8983	0.006	267.455	1734.00	6.48333	0.01542
	0.8993	0.007	269.189	1730.00	6.42671	0.01556
	0.9003	0.008	270.919	1725.00	6.36722	0.01571
	0.9013	0.009	272.644	1720.00	6.30859	0.01585
	0.9023	0.01	274.364			
					δx_i avg. =	0.015
270 K	0.8923	0	215.541	1609.00	7.46494	0.01340
	0.8933	0.001	217.150	1613.00	7.42805	0.01346
	0.8943	0.002	218.763	1617.00	7.39156	0.01353
	0.8953	0.003	220.380	1621.00	7.35548	0.01360
	0.8963	0.004	222.001	1624.00	7.31528	0.01367
	0.8973	0.005	223.625	1628.00	7.28004	0.01374
	0.8983	0.006	225.253	1631.00	7.24075	0.01381

Table B.3.1. (Continued)

Isotherm	C1	C7	ρ (kg/m^3)	dρ/dx	(dρ/dx)(1/ρ)	dxi * 10^{-3} 1/(dρ/dx)(1/ρ)
270 K	0.8993	0.007	226.884	1633.00	7.19751	0.01389
	0.9003	0.008	228.517	1637.00	7.16358	0.01396
	0.9013	0.009	230.154	1638.00	7.11697	0.01405
	0.9023	0.01	231.792			
					δx_i avg. =	0.014
290 K	0.8923	0	181.762	1319.00	7.25674	0.01378
	0.8933	0.001	183.081	1326.00	7.24270	0.01381
	0.8943	0.002	184.407	1333.00	7.22858	0.01383
	0.8953	0.003	185.740	1341.00	7.21977	0.01385
	0.8963	0.004	187.081	1349.00	7.21078	0.01387
	0.8973	0.005	188.430	1355.00	7.19100	0.01391
	0.8983	0.006	189.785	1363.00	7.18181	0.01392
	0.8993	0.007	191.148	1370.00	7.16722	0.01395
	0.9003	0.008	192.518	1376.00	7.14738	0.01399
	0.9013	0.009	193.894	1384.00	7.13792	0.01401
	0.9023	0.01	195.278			
					δx_i avg. =	0.014
310 K	0.8923	0	156.704	1045.00	6.66862	0.01500
	0.8933	0.001	157.749	1051.00	6.66248	0.01501
	0.8943	0.002	158.800	1058.00	6.66247	0.01501
	0.8953	0.003	159.858	1064.00	6.65591	0.01502
	0.8963	0.004	160.922	1071.00	6.65540	0.01503
	0.8973	0.005	161.993	1078.00	6.65461	0.01503
	0.8983	0.006	163.071	1084.00	6.64741	0.01504
	0.8993	0.007	164.155	1091.00	6.64616	0.01505
	0.9003	0.008	165.246	1098.00	6.64464	0.01505
	0.9013	0.009	166.344	1105.00	6.64286	0.01505
	0.9023	0.01	167.449			
					δx_i avg. =	0.015

Table B.3.2. NIST Data for the Case C Gas Mixture at 20.684 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	316.215	1569.00	4.96181	0.02015
	0.8933	0.001	317.784	1562.00	4.91529	0.02034
	0.8943	0.002	319.346	1555.00	4.86933	0.02054
	0.8953	0.003	320.901	1548.00	4.82392	0.02073
	0.8963	0.004	322.449	1542.00	4.78215	0.02091
	0.8973	0.005	323.991	1536.00	4.74087	0.02109
	0.8983	0.006	325.527	1528.00	4.69393	0.02130
	0.8993	0.007	327.055	1522.00	4.65365	0.02149
	0.9003	0.008	328.577	1516.00	4.61383	0.02167
	0.9013	0.009	330.093	1509.00	4.57144	0.02187
	0.9023	0.01	331.602			
					δx_i avg. =	0.021
250 K	0.8923	0	279.437	1606.00	5.74727	0.01740
	0.8933	0.001	281.043	1603.00	5.70375	0.01753
	0.8943	0.002	282.646	1598.00	5.65372	0.01769
	0.8953	0.003	284.244	1594.00	5.60786	0.01783
	0.8963	0.004	285.838	1589.00	5.55909	0.01799
	0.8973	0.005	287.427	1584.00	5.51096	0.01815
	0.8983	0.006	289.011	1579.00	5.46346	0.01830
	0.8993	0.007	290.590	1574.00	5.41657	0.01846
	0.9003	0.008	292.164	1569.00	5.37027	0.01862
	0.9013	0.009	293.733	1565.00	5.32797	0.01877
	0.9023	0.01	295.298			
					δx_i avg. =	0.018
270 K	0.8923	0	243.394	1547.00	6.35595	0.01573
	0.8933	0.001	244.941	1547.00	6.31581	0.01583
	0.8943	0.002	246.488	1546.00	6.27211	0.01594
	0.8953	0.003	248.034	1546.00	6.23302	0.01604
	0.8963	0.004	249.580	1546.00	6.19441	0.01614
	0.8973	0.005	251.126	1545.00	6.15229	0.01625
	0.8983	0.006	252.671	1543.00	6.10676	0.01638

Table B.3.2. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8993	0.007	254.214	1543.00	6.06969	0.01648
	0.9003	0.008	255.757	1542.00	6.02916	0.01659
	0.9013	0.009	257.299	1540.00	5.98525	0.01671
	0.9023	0.01	258.839			
					δx_i avg. =	0.016
290 K	0.8923	0	211.324	1384.00	6.54919	0.01527
	0.8933	0.001	212.708	1386.00	6.51597	0.01535
	0.8943	0.002	214.094	1391.00	6.49715	0.01539
	0.8953	0.003	215.485	1393.00	6.46449	0.01547
	0.8963	0.004	216.878	1397.00	6.44141	0.01552
	0.8973	0.005	218.275	1400.00	6.41393	0.01559
	0.8983	0.006	219.675	1403.00	6.38671	0.01566
	0.8993	0.007	221.078	1406.00	6.35975	0.01572
	0.9003	0.008	222.484	1408.00	6.32854	0.01580
	0.9013	0.009	223.892	1411.00	6.30215	0.01587
	0.9023	0.01	225.303			
					δx_i avg. =	0.016
310 K	0.8923	0	185.048	1180.00	6.37672	0.01568
	0.8933	0.001	186.228	1185.00	6.36317	0.01572
	0.8943	0.002	187.413	1189.00	6.34428	0.01576
	0.8953	0.003	188.602	1194.00	6.33079	0.01580
	0.8963	0.004	189.796	1198.00	6.31204	0.01584
	0.8973	0.005	190.994	1204.00	6.30386	0.01586
	0.8983	0.006	192.198	1206.00	6.27478	0.01594
	0.8993	0.007	193.404	1213.00	6.27185	0.01594
	0.9003	0.008	194.617	1217.00	6.25331	0.01599
	0.9013	0.009	195.834	1221.00	6.23487	0.01604
	0.9023	0.01	197.055			
					δx_i avg. =	0.016

Table B.3.3. NIST Data for the Case C Gas Mixture at 24.132 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	328.620	1485.00	4.51890	0.02213
	0.8933	0.001	330.105	1479.00	4.48039	0.02232
	0.8943	0.002	331.584	1473.00	4.44231	0.02251
	0.8953	0.003	333.057	1467.00	4.40465	0.02270
	0.8963	0.004	334.524	1461.00	4.36740	0.02290
	0.8973	0.005	335.985	1455.00	4.33055	0.02309
	0.8983	0.006	337.440	1449.00	4.29410	0.02329
	0.8993	0.007	338.889	1444.00	4.26098	0.02347
	0.9003	0.008	340.333	1437.00	4.22234	0.02368
	0.9013	0.009	341.770	1431.00	4.18703	0.02388
	0.9023	0.01	343.201			
					δx_i avg. =	0.023
250 K	0.8923	0	296.063	1511.00	5.10364	0.01959
	0.8933	0.001	297.574	1507.00	5.06429	0.01975
	0.8943	0.002	299.081	1502.00	5.02205	0.01991
	0.8953	0.003	300.583	1498.00	4.98365	0.02007
	0.8963	0.004	302.081	1493.00	4.94238	0.02023
	0.8973	0.005	303.574	1488.00	4.90161	0.02040
	0.8983	0.006	305.062	1483.00	4.86131	0.02057
	0.8993	0.007	306.545	1478.00	4.82148	0.02074
	0.9003	0.008	308.023	1473.00	4.78211	0.02091
	0.9013	0.009	309.496	1469.00	4.74643	0.02107
	0.9023	0.01	310.965			
					δx_i avg. =	0.020
270 K	0.8923	0	263.996	1482.00	5.61372	0.01781
	0.8933	0.001	265.478	1480.00	5.57485	0.01794
	0.8943	0.002	266.958	1477.00	5.53271	0.01807
	0.8953	0.003	268.435	1475.00	5.49481	0.01820
	0.8963	0.004	269.910	1473.00	5.45737	0.01832
	0.8973	0.005	271.383	1471.00	5.42038	0.01845

Table B.3.3. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8983	0.006	272.854	1468.00	5.38017	0.01859
	0.8993	0.007	274.322	1465.00	5.34044	0.01873
	0.9003	0.008	275.787	1463.00	5.30482	0.01885
	0.9013	0.009	277.250	1460.00	5.26601	0.01899
	0.9023	0.01	278.710			
					δx_i avg. =	0.018
290 K	0.8923	0	234.371	1386.00	5.91370	0.01691
	0.8933	0.001	235.757	1385.00	5.87469	0.01702
	0.8943	0.002	237.142	1386.00	5.84460	0.01711
	0.8953	0.003	238.528	1386.00	5.81064	0.01721
	0.8963	0.004	239.914	1388.00	5.78541	0.01728
	0.8973	0.005	241.302	1387.00	5.74798	0.01740
	0.8983	0.006	242.689	1388.00	5.71925	0.01748
	0.8993	0.007	244.077	1388.00	5.68673	0.01758
	0.9003	0.008	245.465	1388.00	5.65457	0.01768
	0.9013	0.009	246.853	1389.00	5.62683	0.01777
	0.9023	0.01	248.242			
					δx_i avg. =	0.017
310 K	0.8923	0	208.634	1245.00	5.96739	0.01676
	0.8933	0.001	209.879	1246.00	5.93675	0.01684
	0.8943	0.002	211.125	1249.00	5.91593	0.01690
	0.8953	0.003	212.374	1251.00	5.89055	0.01698
	0.8963	0.004	213.625	1253.00	5.86542	0.01705
	0.8973	0.005	214.878	1256.00	5.84518	0.01711
	0.8983	0.006	216.134	1258.00	5.82046	0.01718
	0.8993	0.007	217.392	1260.00	5.79598	0.01725
	0.9003	0.008	218.652	1263.00	5.77630	0.01731
	0.9013	0.009	219.915	1264.00	5.74768	0.01740
	0.9023	0.01	221.179			
					δx_i avg. =	0.017

Table B.3.4 NIST Data for the Case C Gas Mixture at 27.579 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	338.857	1428.00	4.21417	0.02373
	0.8933	0.001	340.285	1422.00	4.17885	0.02393
	0.8943	0.002	341.707	1417.00	4.14683	0.02411
	0.8953	0.003	343.124	1411.00	4.11222	0.02432
	0.8963	0.004	344.535	1405.00	4.07796	0.02452
	0.8973	0.005	345.940	1400.00	4.04694	0.02471
	0.8983	0.006	347.340	1395.00	4.01624	0.02490
	0.8993	0.007	348.735	1389.00	3.98297	0.02511
	0.9003	0.008	350.124	1383.00	3.95003	0.02532
	0.9013	0.009	351.507	1378.00	3.92026	0.02551
	0.9023	0.01	352.885			
					δx_i avg. =	0.025
250 K	0.8923	0	309.278	1446.00	4.67541	0.02139
	0.8933	0.001	310.724	1442.00	4.64077	0.02155
	0.8943	0.002	312.166	1437.00	4.60332	0.02172
	0.8953	0.003	313.603	1433.00	4.56947	0.02188
	0.8963	0.004	315.036	1428.00	4.53282	0.02206
	0.8973	0.005	316.464	1423.00	4.49656	0.02224
	0.8983	0.006	317.887	1418.00	4.46070	0.02242
	0.8993	0.007	319.305	1414.00	4.42837	0.02258
	0.9003	0.008	320.719	1408.00	4.39014	0.02278
	0.9013	0.009	322.127	1404.00	4.35853	0.02294
	0.9023	0.01	323.531			
					δx_i avg. =	0.022
270 K	0.8923	0	280.142	1429.00	5.10098	0.01960
	0.8933	0.001	281.571	1426.00	5.06444	0.01975
	0.8943	0.002	282.997	1423.00	5.02832	0.01989
	0.8953	0.003	284.420	1420.00	4.99262	0.02003
	0.8963	0.004	285.840	1417.00	4.95732	0.02017
	0.8973	0.005	287.257	1414.00	4.92242	0.02032
	0.8983	0.006	288.671	1410.00	4.88445	0.02047

Table B.3.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8993	0.007	290.081	1407.00	4.85037	0.02062
	0.9003	0.008	291.488	1404.00	4.81666	0.02076
	0.9013	0.009	292.892	1401.00	4.78333	0.02091
	0.9023	0.01	294.293			
					δx_i avg. =	0.020
290 K	0.8923	0	252.741	1366.00	5.40474	0.01850
	0.8933	0.001	254.107	1366.00	5.37569	0.01860
	0.8943	0.002	255.473	1364.00	5.33912	0.01873
	0.8953	0.003	256.837	1364.00	5.31076	0.01883
	0.8963	0.004	258.201	1362.00	5.27496	0.01896
	0.8973	0.005	259.563	1362.00	5.24728	0.01906
	0.8983	0.006	260.925	1360.00	5.21223	0.01919
	0.8993	0.007	262.285	1358.00	5.17757	0.01931
	0.9003	0.008	263.643	1358.00	5.15090	0.01941
	0.9013	0.009	265.001	1356.00	5.11696	0.01954
	0.9023	0.01	266.357			
					δx_i avg. =	0.019
310 K	0.8923	0	228.130	1268.00	5.55823	0.01799
	0.8933	0.001	229.398	1269.00	5.53187	0.01808
	0.8943	0.002	230.667	1269.00	5.50144	0.01818
	0.8953	0.003	231.936	1270.00	5.47565	0.01826
	0.8963	0.004	233.206	1270.00	5.44583	0.01836
	0.8973	0.005	234.476	1271.00	5.42060	0.01845
	0.8983	0.006	235.747	1272.00	5.39561	0.01853
	0.8993	0.007	237.019	1272.00	5.36666	0.01863
	0.9003	0.008	238.291	1273.00	5.34221	0.01872
	0.9013	0.009	239.564	1272.00	5.30965	0.01883
	0.9023	0.01	240.836			
					δx_i avg. =	0.018

Table B.3.5. NIST Data for the Case C Gas Mixture at 31.026 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	347.611	1386.00	3.98722	0.02508
	0.8933	0.001	348.997	1381.00	3.95705	0.02527
	0.8943	0.002	350.378	1375.00	3.92433	0.02548
	0.8953	0.003	351.753	1370.00	3.89478	0.02568
	0.8963	0.004	353.123	1365.00	3.86551	0.02587
	0.8973	0.005	354.488	1360.00	3.83652	0.02607
	0.8983	0.006	355.848	1354.00	3.80500	0.02628
	0.8993	0.007	357.202	1349.00	3.77657	0.02648
	0.9003	0.008	358.551	1344.00	3.74842	0.02668
	0.9013	0.009	359.895	1338.00	3.71775	0.02690
	0.9023	0.01	361.233			
					δx_i avg. =	0.026
250 K	0.8923	0	320.272	1400.00	4.37128	0.02288
	0.8933	0.001	321.672	1395.00	4.33672	0.02306
	0.8943	0.002	323.067	1390.00	4.30251	0.02324
	0.8953	0.003	324.457	1386.00	4.27175	0.02341
	0.8963	0.004	325.843	1381.00	4.23824	0.02359
	0.8973	0.005	327.224	1376.00	4.20507	0.02378
	0.8983	0.006	328.600	1371.00	4.17225	0.02397
	0.8993	0.007	329.971	1367.00	4.14279	0.02414
	0.9003	0.008	331.338	1362.00	4.11061	0.02433
	0.9013	0.009	332.700	1357.00	4.07875	0.02452
	0.9023	0.01	334.057			
					δx_i avg. =	0.024
270 K	0.8923	0	293.373	1389.00	4.73459	0.02112
	0.8933	0.001	294.762	1384.00	4.69531	0.02130
	0.8943	0.002	296.146	1381.00	4.66324	0.02144
	0.8953	0.003	297.527	1378.00	4.63151	0.02159
	0.8963	0.004	298.905	1373.00	4.59343	0.02177
	0.8973	0.005	300.278	1371.00	4.56577	0.02190
	0.8983	0.006	301.649	1366.00	4.52844	0.02208

Table B.3.4. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8993	0.007	303.015	1363.00	4.49813	0.02223
	0.9003	0.008	304.378	1360.00	4.46813	0.02238
	0.9013	0.009	305.738	1356.00	4.43517	0.02255
	0.9023	0.01	307.094			
					δx_i avg. =	0.022
290 K	0.8923	0	267.837	1344.00	5.01798	0.01993
	0.8933	0.001	269.181	1343.00	4.98921	0.02004
	0.8943	0.002	270.524	1340.00	4.95335	0.02019
	0.8953	0.003	271.864	1339.00	4.92526	0.02030
	0.8963	0.004	273.203	1337.00	4.89380	0.02043
	0.8973	0.005	274.540	1334.00	4.85904	0.02058
	0.8983	0.006	275.874	1332.00	4.82829	0.02071
	0.8993	0.007	277.206	1331.00	4.80148	0.02083
	0.9003	0.008	278.537	1327.00	4.76418	0.02099
	0.9013	0.009	279.864	1326.00	4.73802	0.02111
	0.9023	0.01	281.190			
					δx_i avg. =	0.021
310 K	0.8923	0	244.443	1273.00	5.20776	0.01920
	0.8933	0.001	245.716	1272.00	5.17671	0.01932
	0.8943	0.002	246.988	1271.00	5.14600	0.01943
	0.8953	0.003	248.259	1271.00	5.11965	0.01953
	0.8963	0.004	249.530	1271.00	5.09358	0.01963
	0.8973	0.005	250.801	1270.00	5.06378	0.01975
	0.8983	0.006	252.071	1270.00	5.03826	0.01985
	0.8993	0.007	253.341	1269.00	5.00906	0.01996
	0.9003	0.008	254.610	1269.00	4.98409	0.02006
	0.9013	0.009	255.879	1266.00	4.94765	0.02021
	0.9023	0.01	257.145			
					δx_i avg. =	0.020

Table B.3.6. NIST Data for the Case C Gas Mixture at 34.474 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	355.281	1355.00	3.81388	0.02622
	0.8933	0.001	356.636	1349.00	3.78257	0.02644
	0.8943	0.002	357.985	1344.00	3.75435	0.02664
	0.8953	0.003	359.329	1339.00	3.72639	0.02684
	0.8963	0.004	360.668	1334.00	3.69869	0.02704
	0.8973	0.005	362.002	1328.00	3.66849	0.02726
	0.8983	0.006	363.330	1324.00	3.64407	0.02744
	0.8993	0.007	364.654	1318.00	3.61439	0.02767
	0.9003	0.008	365.972	1313.00	3.58771	0.02787
	0.9013	0.009	367.285	1308.00	3.56127	0.02808
	0.9023	0.01	368.593			
					δx_i avg. =	0.027
250 K	0.8923	0	329.707	1364.00	4.13701	0.02417
	0.8933	0.001	331.071	1359.00	4.10486	0.02436
	0.8943	0.002	332.430	1355.00	4.07605	0.02453
	0.8953	0.003	333.785	1350.00	4.04452	0.02472
	0.8963	0.004	335.135	1346.00	4.01629	0.02490
	0.8973	0.005	336.481	1340.00	3.98239	0.02511
	0.8983	0.006	337.821	1336.00	3.95476	0.02529
	0.8993	0.007	339.157	1332.00	3.92738	0.02546
	0.9003	0.008	340.489	1326.00	3.89440	0.02568
	0.9013	0.009	341.815	1322.00	3.86759	0.02586
	0.9023	0.01	343.137			
					δx_i avg. =	0.025
270 K	0.8923	0	304.577	1356.00	4.45208	0.02246
	0.8933	0.001	305.933	1352.00	4.41927	0.02263
	0.8943	0.002	307.285	1348.00	4.38681	0.02280
	0.8953	0.003	308.633	1345.00	4.35793	0.02295
	0.8963	0.004	309.978	1340.00	4.32289	0.02313
	0.8973	0.005	311.318	1337.00	4.29464	0.02328
	0.8983	0.006	312.655	1332.00	4.26029	0.02347

Table B.3.6. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8993	0.007	313.987	1329.00	4.23266	0.02363
	0.9003	0.008	315.316	1325.00	4.20213	0.02380
	0.9013	0.009	316.641	1321.00	4.17192	0.02397
	0.9023	0.01	317.962			
					δx_i avg. =	0.023
290 K	0.8923	0	280.588	1324.00	4.71866	0.02119
	0.8933	0.001	281.912	1321.00	4.68586	0.02134
	0.8943	0.002	283.233	1319.00	4.65694	0.02147
	0.8953	0.003	284.552	1316.00	4.62481	0.02162
	0.8963	0.004	285.868	1313.00	4.59303	0.02177
	0.8973	0.005	287.181	1311.00	4.56507	0.02191
	0.8983	0.006	288.492	1307.00	4.53045	0.02207
	0.8993	0.007	289.799	1305.00	4.50312	0.02221
	0.9003	0.008	291.104	1303.00	4.47606	0.02234
	0.9013	0.009	292.407	1299.00	4.44244	0.02251
	0.9023	0.01	293.706			
					δx_i avg. =	0.022
310 K	0.8923	0	258.336	1270.00	4.91608	0.02034
	0.8933	0.001	259.606	1268.00	4.88432	0.02047
	0.8943	0.002	260.874	1268.00	4.86058	0.02057
	0.8953	0.003	262.142	1266.00	4.82944	0.02071
	0.8963	0.004	263.408	1265.00	4.80244	0.02082
	0.8973	0.005	264.673	1263.00	4.77193	0.02096
	0.8983	0.006	265.936	1261.00	4.74174	0.02109
	0.8993	0.007	267.197	1259.00	4.71188	0.02122
	0.9003	0.008	268.456	1258.00	4.68606	0.02134
	0.9013	0.009	269.714	1256.00	4.65678	0.02147
	0.9023	0.01	270.970			
					δx_i avg. =	0.021

Table B.3.7. NIST Data for the Case C Gas Mixture at 37.921 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
230 K	0.8923	0	362.125	1329.00	3.67000	0.02725
	0.8933	0.001	363.454	1324.00	3.64283	0.02745
	0.8943	0.002	364.778	1319.00	3.61590	0.02766
	0.8953	0.003	366.097	1315.00	3.59194	0.02784
	0.8963	0.004	367.412	1309.00	3.56276	0.02807
	0.8973	0.005	368.721	1304.00	3.53655	0.02828
	0.8983	0.006	370.025	1299.00	3.51057	0.02849
	0.8993	0.007	371.324	1293.00	3.48213	0.02872
	0.9003	0.008	372.617	1289.00	3.45932	0.02891
	0.9013	0.009	373.906	1284.00	3.43402	0.02912
	0.9023	0.01	375.190			
					δx_i avg. =	0.028
250 K	0.8923	0	337.985	1336.00	3.95284	0.02530
	0.8933	0.001	339.321	1332.00	3.92549	0.02547
	0.8943	0.002	340.653	1327.00	3.89546	0.02567
	0.8953	0.003	341.980	1322.00	3.86572	0.02587
	0.8963	0.004	343.302	1318.00	3.83919	0.02605
	0.8973	0.005	344.620	1313.00	3.80999	0.02625
	0.8983	0.006	345.933	1308.00	3.78108	0.02645
	0.8993	0.007	347.241	1304.00	3.75532	0.02663
	0.9003	0.008	348.545	1299.00	3.72692	0.02683
	0.9013	0.009	349.844	1294.00	3.69879	0.02704
	0.9023	0.01	351.138			
					δx_i avg. =	0.026
270 K	0.8923	0	314.298	1330.00	4.23165	0.02363
	0.8933	0.001	315.628	1325.00	4.19798	0.02382
	0.8943	0.002	316.953	1322.00	4.17097	0.02398
	0.8953	0.003	318.275	1318.00	4.14107	0.02415
	0.8963	0.004	319.593	1313.00	4.10835	0.02434
	0.8973	0.005	320.906	1310.00	4.08219	0.02450
	0.8983	0.006	322.216	1306.00	4.05318	0.02467

Table B.3.7. (Continued)

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
270 K	0.8993	0.007	323.522	1301.00	4.02136	0.02487
	0.9003	0.008	324.823	1298.00	3.99602	0.02502
	0.9013	0.009	326.121	1293.00	3.96479	0.02522
	0.9023	0.01	327.414			
					δx_i avg. =	0.024
290 K	0.8923	0	291.605	1305.00	4.47523	0.02235
	0.8933	0.001	292.910	1303.00	4.44847	0.02248
	0.8943	0.002	294.213	1299.00	4.41517	0.02265
	0.8953	0.003	295.512	1296.00	4.38561	0.02280
	0.8963	0.004	296.808	1293.00	4.35635	0.02295
	0.8973	0.005	298.101	1290.00	4.32739	0.02311
	0.8983	0.006	299.391	1287.00	4.29873	0.02326
	0.8993	0.007	300.678	1283.00	4.26702	0.02344
	0.9003	0.008	301.961	1281.00	4.24227	0.02357
	0.9013	0.009	303.242	1277.00	4.21116	0.02375
	0.9023	0.01	304.519			
					δx_i avg. =	0.023
310 K	0.8923	0	270.377	1263.00	4.67126	0.02141
	0.8933	0.001	271.640	1262.00	4.64585	0.02152
	0.8943	0.002	272.902	1261.00	4.62071	0.02164
	0.8953	0.003	274.163	1258.00	4.58851	0.02179
	0.8963	0.004	275.421	1255.00	4.55666	0.02195
	0.8973	0.005	276.676	1254.00	4.53238	0.02206
	0.8983	0.006	277.930	1251.00	4.50113	0.02222
	0.8993	0.007	279.181	1248.00	4.47022	0.02237
	0.9003	0.008	280.429	1247.00	4.44676	0.02249
	0.9013	0.009	281.676	1244.00	4.41642	0.02264
	0.9023	0.01	282.920			
					δx_i avg. =	0.022

Table B.4. NIST Calculations for the Case C Gas Mixture at 13.79 Mpa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	109.779	648.00	5.90277	0.01694
	0.8913	0.001	110.427	655.00	5.93152	0.01686
	0.8903	0.002	111.082	657.00	5.91455	0.01691
	0.8893	0.003	111.739	655.00	5.86187	0.01706
	0.8883	0.004	112.394	663.00	5.89889	0.01695
	0.8873	0.005	113.057	664.00	5.87314	0.01703
	0.8863	0.006	113.721	670.00	5.89161	0.01697
	0.8853	0.007	114.391	679.00	5.93578	0.01685
	0.8843	0.008	115.070	674.00	5.85730	0.01707
	0.8833	0.009	115.744	679.00	5.86639	0.01705
	0.8823	0.01	116.423			
					δx_i avg. =	0.017
350 K	0.8923	0	99.082	456.70	4.60929	0.02170
	0.8913	0.001	99.539	381.70	3.83467	0.02608
	0.8903	0.002	99.921	806.20	8.06839	0.01239
	0.8893	0.003	100.727	1149.00	11.40707	0.00877
	0.8883	0.004	101.876	309.00	3.03310	0.03297
	0.8873	0.005	102.185	493.00	4.82458	0.02073
	0.8863	0.006	102.678	665.00	6.47656	0.01544
	0.8853	0.007	103.343	-601.00	-5.81558	-0.01720
	0.8843	0.008	102.742	2978.00	28.98523	0.00345
	0.8833	0.009	105.720	-1030.00	-9.74272	-0.01026
	0.8823	0.01	104.690			
					δx_i avg. =	0.011

Table B.4.1 NIST Calculations for the Case C Gas Mixture at 17.237 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	138.324	845.00	6.10885	0.01637
	0.8933	0.001	139.169	850.00	6.10768	0.01637
	0.8943	0.002	140.019	854.00	6.09917	0.01640
	0.8953	0.003	140.873	858.00	6.09059	0.01642
	0.8963	0.004	141.731	863.00	6.08900	0.01642
	0.8973	0.005	142.594	867.00	6.08020	0.01645
	0.8983	0.006	143.461	872.00	6.07831	0.01645
	0.8993	0.007	144.333	877.00	6.07623	0.01646
	0.9003	0.008	145.210	882.00	6.07396	0.01646
	0.9013	0.009	146.092	886.00	6.06467	0.01649
	0.9023	0.01	146.978			
					δx_i avg. =	0.016
350 K	0.8923	0	124.451	623.00	5.00599	0.01998
	0.8933	0.001	125.074	959.00	7.66746	0.01304
	0.8943	0.002	126.033	548.00	4.34807	0.02300
	0.8953	0.003	126.581	990.00	7.82108	0.01279
	0.8963	0.004	127.571	-269.00	-2.10863	-0.04742
	0.8973	0.005	127.302	840.00	6.59848	0.01516
	0.8983	0.006	128.142	1356.00	10.58201	0.00945
	0.8993	0.007	129.498	551.00	4.25489	0.02350
	0.9003	0.008	130.049	-415.00	-3.19110	-0.03134
	0.9013	0.009	129.634	2334.00	18.00454	0.00555
	0.9023	0.01	131.968			
					δx_i avg. =	0.004

Table B.4.2. NIST Calculations for the Case C Gas Mixture at 20.684 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	164.384	992.00	6.03465	0.01657
	0.8933	0.001	165.376	1005.00	6.07706	0.01646
	0.8943	0.002	166.381	1005.00	6.04035	0.01656
	0.8953	0.003	167.386	1008.00	6.02201	0.01661
	0.8963	0.004	168.394	1013.00	6.01565	0.01662
	0.8973	0.005	169.407	1016.00	5.99739	0.01667
	0.8983	0.006	170.423	1022.00	5.99684	0.01668
	0.8993	0.007	171.445	1024.00	5.97276	0.01674
	0.9003	0.008	172.469	1030.00	5.97209	0.01674
	0.9013	0.009	173.499	1035.00	5.96545	0.01676
	0.9023	0.01	174.534			
					δx_i avg. =	0.017
350 K	0.8923	0	148.191	983.00	6.63333	0.01508
	0.8933	0.001	149.174	1475.00	9.88778	0.01011
	0.8943	0.002	150.649	932.00	6.18657	0.01616
	0.8953	0.003	151.581	-548.00	-3.61523	-0.02766
	0.8963	0.004	151.033	1044.00	6.91240	0.01447
	0.8973	0.005	152.077	612.00	4.02428	0.02485
	0.8983	0.006	152.689	638.00	4.17843	0.02393
	0.8993	0.007	153.327	747.00	4.87194	0.02053
	0.9003	0.008	154.074	804.00	5.21827	0.01916
	0.9013	0.009	154.878	830.00	5.35906	0.01866
	0.9023	0.01	155.708			
					δx_i avg. =	0.014

Table B.4.3. NIST Calculations for the Case C Gas Mixture at 24.132 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	187.206	1100.00	5.87588	0.01702
	0.8933	0.001	188.306	1093.00	5.80438	0.01723
	0.8943	0.002	189.399	1101.00	5.81312	0.01720
	0.8953	0.003	190.500	1113.00	5.84252	0.01712
	0.8963	0.004	191.613	1016.00	5.30235	0.01886
	0.8973	0.005	192.629	1187.00	6.16210	0.01623
	0.8983	0.006	193.816	1116.00	5.75804	0.01737
	0.8993	0.007	194.932	1116.00	5.72507	0.01747
	0.9003	0.008	196.048	1116.00	5.69248	0.01757
	0.9013	0.009	197.164	1122.00	5.69069	0.01757
	0.9023	0.01	198.286			
					δx_i avg. =	0.017
350 K	0.8923	0	169.688	1010.00	5.95210	0.01680
	0.8933	0.001	170.698	1438.00	8.42423	0.01187
	0.8943	0.002	172.136	-196.00	-1.13863	-0.08782
	0.8953	0.003	171.940	1834.00	10.66651	0.00938
	0.8963	0.004	173.774	636.00	3.65993	0.02732
	0.8973	0.005	174.410	438.00	2.51132	0.03982
	0.8983	0.006	174.848	1928.00	11.02672	0.00907
	0.8993	0.007	176.776	415.00	2.34760	0.04260
	0.9003	0.008	177.191	1127.00	6.36037	0.01572
	0.9013	0.009	178.318	1527.00	8.56335	0.01168
	0.9023	0.01	179.845			
					δx_i avg. =	0.010

Table B.4.4. NIST Calculations for the Case C Gas Mixture at 27.579 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	206.816	1151.00	5.56533	0.01797
	0.8933	0.001	207.967	1158.00	5.56819	0.01796
	0.8943	0.002	209.125	1151.00	5.50389	0.01817
	0.8953	0.003	210.276	1155.00	5.49278	0.01821
	0.8963	0.004	211.431	1164.00	5.50534	0.01816
	0.8973	0.005	212.595	1079.00	5.07538	0.01970
	0.8983	0.006	213.674	1233.00	5.77047	0.01733
	0.8993	0.007	214.907	1157.00	5.38372	0.01857
	0.9003	0.008	216.064	1173.00	5.42895	0.01842
	0.9013	0.009	217.237	1171.00	5.39043	0.01855
	0.9023	0.01	218.408			
					δx_i avg. =	0.018
350 K	0.8923	0	188.759	1147.00	6.07653	0.01646
	0.8933	0.001	189.906	828.00	4.36005	0.02294
	0.8943	0.002	190.734	1221.00	6.40159	0.01562
	0.8953	0.003	191.955	989.00	5.15225	0.01941
	0.8963	0.004	192.944	387.00	2.00576	0.04986
	0.8973	0.005	193.331	2307.00	11.93290	0.00838
	0.8983	0.006	195.638	682.00	3.48603	0.02869
	0.8993	0.007	196.320	246.00	1.25306	0.07980
	0.9003	0.008	196.566	1532.00	7.79382	0.01283
	0.9013	0.009	198.098	1212.00	6.11818	0.01634
	0.9023	0.01	199.310			
					δx_i avg. =	0.027

Table B.4.5 NIST Data for the Case C Gas Mixture at 31.026 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	223.645	1187.00	5.30752	0.01884
	0.8933	0.001	224.832	1184.00	5.26615	0.01899
	0.8943	0.002	226.016	1185.00	5.24299	0.01907
	0.8953	0.003	227.201	818.00	3.60034	0.02778
	0.8963	0.004	228.019	1526.00	6.69242	0.01494
	0.8973	0.005	229.545	1200.00	5.22773	0.01913
	0.8983	0.006	230.745	1174.00	5.08787	0.01965
	0.8993	0.007	231.919	1196.00	5.15697	0.01939
	0.9003	0.008	233.115	1193.00	5.11765	0.01954
	0.9013	0.009	234.308	1192.00	5.08732	0.01966
	0.9023	0.01	235.500			
					δx_i avg. =	0.020
350 K	0.8923	0	205.542	1162.00	5.65335	0.01769
	0.8933	0.001	206.704	749.00	3.62354	0.02760
	0.8943	0.002	207.453	1346.00	6.48822	0.01541
	0.8953	0.003	208.799	602.00	2.88316	0.03468
	0.8963	0.004	209.401	2235.00	10.67330	0.00937
	0.8973	0.005	211.636	1143.00	5.40078	0.01852
	0.8983	0.006	212.779	1181.00	5.55036	0.01802
	0.8993	0.007	213.960	422.00	1.97233	0.05070
	0.9003	0.008	214.382	1398.00	6.52107	0.01533
	0.9013	0.009	215.780	809.00	3.74919	0.02667
	0.9023	0.01	216.589			
					δx_i avg. =	0.023

Table B.4.6. NIST Calculations for the Case C Gas Mixture at 34.474 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	238.201	1201.00	5.04196	0.01983
	0.8933	0.001	239.402	1120.00	4.67832	0.02138
	0.8943	0.002	240.522	1283.00	5.33423	0.01875
	0.8953	0.003	241.805	1165.00	4.81793	0.02076
	0.8963	0.004	242.970	1207.00	4.96769	0.02013
	0.8973	0.005	244.177	1203.00	4.92675	0.02030
	0.8983	0.006	245.380	1215.00	4.95150	0.02020
	0.8993	0.007	246.595	1198.00	4.85817	0.02058
	0.9003	0.008	247.793	1197.00	4.83064	0.02070
	0.9013	0.009	248.990	1197.00	4.80742	0.02080
	0.9023	0.01	250.187			
					δx_i avg. =	0.020
350 K	0.8923	0	220.320	1152.00	5.22876	0.01912
	0.8933	0.001	221.472	844.00	3.81087	0.02624
	0.8943	0.002	222.316	2014.00	9.05918	0.01104
	0.8953	0.003	224.330	1591.00	7.09223	0.01410
	0.8963	0.004	225.921	1452.00	6.42703	0.01556
	0.8973	0.005	227.373	-140.00	-0.61573	-0.16241
	0.8983	0.006	227.233	-6.00	-0.02640	-3.78722
	0.8993	0.007	227.227	1477.00	6.50011	0.01538
	0.9003	0.008	228.704	854.00	3.73408	0.02678
	0.9013	0.009	229.558	1228.00	5.34941	0.01869
	0.9023	0.01	230.786			
					δx_i avg. =	-0.380

Table B.4.7. NIST Calculations for the Case C Gas Mixture at 37.921 MPa

Isotherm	x (CH_4)	x (n-C_7H_{14})	ρ (kg/m^3)	dρ/dx (kg/m^3)	(dρ/dx)(1/ρ)	δx_i mol (%)
330 K	0.8923	0	250.930	1210.00	4.82206	0.02074
	0.8933	0.001	252.140	1208.00	4.79099	0.02087
	0.8943	0.002	253.348	1204.00	4.75236	0.02104
	0.8953	0.003	254.552	1206.00	4.73774	0.02111
	0.8963	0.004	255.758	1204.00	4.70758	0.02124
	0.8973	0.005	256.962	1203.00	4.68163	0.02136
	0.8983	0.006	258.165	1202.00	4.65594	0.02148
	0.8993	0.007	259.367	1201.00	4.63050	0.02160
	0.9003	0.008	260.568	1199.00	4.60149	0.02173
	0.9013	0.009	261.767	1190.00	4.54603	0.02200
	0.9023	0.01	262.957			
					δx_i avg. =	0.021
350	0.8923	0	233.405	907.00	3.88595	0.02573
	0.8933	0.001	234.312	1132.00	4.83117	0.02070
	0.8943	0.002	235.444	1926.00	8.18029	0.01222
	0.8953	0.003	237.370	1345.00	5.66626	0.01765
	0.8963	0.004	238.715	749.00	3.13763	0.03187
	0.8973	0.005	239.464	932.00	3.89203	0.02569
	0.8983	0.006	240.396	1401.00	5.82788	0.01716
	0.8993	0.007	241.797	3629.00	15.00846	0.00666
	0.9003	0.008	245.426	-577.00	-2.35101	-0.04253
	0.9013	0.009	244.849	684.00	2.79356	0.03580
	0.9023	0.01	245.533			
					δx_i avg. =	0.015

VITA

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