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INFLUENCE OF PARAMETERS IN EQUATIONS OF STATE ON THERMODYNAMIC PROPERTIES

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พิมพ์ต้นฉบับบทคัดย่อวิทยานิพนธ์ภายในกรอบสีเขียวนี้เพียงแผ่นเดียว

สุพินดา วาดสันทัด: อิทธิพลของค่าตัวแปรเสริมในสมการสภาวะที่มีต่อค่าสมบัติทางเทอร์โมไดนามิกส์ (INFLUENCE OF PARAMETERS IN EQUATIONS OF STATE ON THERMODYNAMIC PROPERTIES) อาจารย์ที่ปรึกษา : รศ.ดร. เกริกชัย สุกาญจนัจที, 281 หน้า. ISBN 974-634-463-3

การหาอิทธิพลของค่าตัวแปรเสริมในสมการสภาวะ ที่มีต่อค่าสมบัติทางเทอร์โมไดนามิกส์ โดยศึกษาจากสมการสภาวะดังต่อไปนี้ ได้แก่ Soave-Redlich-Kwong, Peng-Robinson, Adachi-Lu-Sugie, Twu-Coon-Cunningham, และ Shah-Bienkowski-Cochran และศึกษาค่าสมบัติทางเทอร์โมไดนามิกส์ ได้แก่ compressibility factor, enthalpy departure, entropy departure, fugacity coefficient, และ vapor pressure จากการศึกษาพบว่า ค่าตัวแปรเสริมมีผลต่อค่าสมบัติทางเทอร์โมไดนามิกส์ในสมการสภาวะที่ใช้ศึกษาค่อนข้างใกล้เคียงกัน โดยเรียงลำดับอิทธิพลของค่าตัวแปรเสริมที่มีต่อค่าสมบัติทางเทอร์โมไดนามิกส์จากมากไปหาน้อยได้ ดังนี้ SBC > ALS ≥ PR ≥ SRK > TCC.

ภาควิชา วิศวกรรมเคมี ลายมือชื่อนิสิต สุพินดา วาดสันทัด

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The influence of parameters in equations of state on thermodynamic properties was determined. The equations of state studied are Soave-Redlich-Kwong, Peng-Robinson, Adachi-Lu-Sugie, Twu-Coon-Cunningham, and Shah-Bienkowski-Cochran.

The thermodynamic properties studied are compressibility factor, enthalpy departure, entropy departure, fugacity coefficient, and vapor pressure.

The result of this study reveals that the sensitivity of the thermodynamic properties due to the variation of the parameter values in each equation of state studied is about the same. However, it can be concluded that the magnitude of the sensitivity to the equations of state of the thermodynamic properties in decreasing order is as follows: SBC > ALS $\geq$ PR $\geq$ SRK > TCC.

ภาควิชา วิศวกรรมเคมี ลายมือชื่อนิสิต Supinda Wadsontad

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TABLE PAGE

compressibility factor, vapor and liquid fugacity coefficient, and vapor pressure....168

B.9 PR EOS; methane; % deviation of thermodynamic properties as parameter a(T) varies....169

B.10 PR EOS; methane; % deviation of thermodynamic properties as parameter b varies....171

B.11 PR EOS; n-nonane; % deviation of thermodynamic properties as parameter a(T) varies....173

B.12 PR EOS; n-nonane; % deviation of thermodynamic properties as parameter b varies....175

B.13 PR EOS; n-decane; % deviation of thermodynamic properties as parameter a(T) varies....177

B.14 PR EOS; n-decane; % deviation of thermodynamic properties as parameter b varies....179

B.15 PR EOS; methane, n-nonane, and n-decane; % deviation of vapor pressure as parameters a(T) and b varie....181

B.16 PR EOS; methane, n-nonane, and n-decane; vapor and liquid compressibility factor, vapor and liquid fugacity coefficient, and vapor pressure....182

B.17 ALS EOS; methane; % deviation of thermodynamic properties as parameter a(T) varies....183

B.18 ALS EOS; methane; % deviation of thermodynamic properties as parameter b_1 varies....185

B.19 ALS EOS; methane; % deviation of thermodynamic properties as parameter b_2 varies....187

B.20 ALS EOS; methane; % deviation of thermodynamic properties as

CONTENT

PAGE

ABSTRACT(THAI).....IV

ABSTRACT(ENGLISH).....V

ACKNOWLEDGEMENTS.....VI

LIST OF TABLES.....VIII

LIST OF FIGURES.....XVI

LIST OF SYMBOLS.....XIX

CHAPTER

I. INTRODUCTION.....1

II. EQUATIONS OF STATE.....4

III. IMPORTANT THERMODYNAMIC FUNCTIONS FROM EQUATIONS OF STATE.....14

IV. SELECTED EQUATIONS OF STATE.....20

V. THERMODYNAMIC FUNCTIONS FROM SELECTED EQUATIONS OF STATE.....47

VI. RESULTS AND DISCUSSION.....66

VII. CONCLUSION AND RECOMMENDATION.....119

REFERENCES.....120

APPENDIX A: LISTS OF COMPUTER PROGRAM.....122

APPENDIX B: TABLES.....154

APPENDIX C: LISTS OF FUNDAMENTAL PROPERTIES.....279

VITA.....281

LISTS OF TABLES

TABLE PAGE

4.1 Overall comparison in the two-phase state.....23

4.2 Measured and predicted liquid and vapor-phase comparison of mixture 7 at T=394 K and P=12.4 MPa.....33

4.3 Average absolute deviation percents (AAD%) when predictng saturated vapor pressure (VP) and saturated liquid densities (DENS) from the triple point to the critical temperature using the SBC EOS.....39

4.4 The binary interaction parameters for binaries.....39

4.5 Comparison of Physical and Thermodynamic Properties:AAD summary.....46

B.1 SRK EOS; methane; % deviation of thermodynamic properties as parameter a(T) varies.....155

B.2 SRK EOS; methane; % deviation of thermodynamic properties as parameter b varies.....157

B.3 SRK EOS; n-nonane; % deviation of thermodynamic properties as parameter a(T) varies.....159

B.4 SRK EOS; n-nonane; % deviation of thermodynamic properties as parameter b varies.....161

B.5 SRK EOS; n-decane; % deviation of thermodynamic properties as parameter a(T) varies.....163

B.6 SRK EOS; n-decane; % deviation of thermodynamic properties as parameter b varies.....165

B.7 SRK EOS; methane, n-nonane, and n-decane; % deviation of vapor pressure as parameters a(T) and b varie.....167

B.8 SRK EOS; methane, n-nonane, and n-decane; vapor and liquid

TABLE PAGE

parameter b_3 varies....189

B.21 ALS EOS; n-nonane; % deviation of thermodynamic properties as parameter a(T) varies....191

B.22 ALS EOS; n-nonane; % deviation of thermodynamic properties as parameter b_1 varies....193

B.23 ALS EOS; n-nonane; % deviation of thermodynamic properties as parameter b_2 varies....195

B.24 ALS EOS; n-nonane; % deviation of thermodynamic properties as parameter b_3 varies....197

B.25 ALS EOS; n-decane; % deviation of thermodynamic properties as parameter a(T) varies....199

B.26 ALS EOS; n-decane; % deviation of thermodynamic properties as parameter b_1 varies....201

B.27 ALS EOS; n-decane; % deviation of thermodynamic properties as parameter b_2 varies....203

B.28 ALS EOS; n-decane; % deviation of thermodynamic properties as parameter b_3 varies....205

B.29 ALS EOS; methane, n-nonane, and n-decane; % deviation of vapor pressure as parameters a(T) and b varie....207

B.30 ALS EOS; methane, n-nonane, and n-decane; vapor and liquid compressibility factor, vapor and liquid fugacity coefficient, and vapor pressure....209

B.31 TCC EOS; methane; % deviation of thermodynamic properties as parameter a(T) varies....210

B.32 TCC EOS; methane; % deviation of thermodynamic properties as parameter b varies....212

TABLE PAGE

B.33 TCC EOS; methane; % deviation of thermodynamic properties as parameter c varies....214

B.34 TCC EOS; n-nonane; % deviation of thermodynamic properties as parameter a(T) varies....216

B.35 TCC EOS; n-nonane; % deviation of thermodynamic properties as parameter b varies....218

B.36 TCC EOS; n-nonane; % deviation of thermodynamic properties as parameter c varies....220

B.37 TCC EOS; n-decane; % deviation of thermodynamic properties as parameter a(T) varies....222

B.38 TCC EOS; n-decane; % deviation of thermodynamic properties as parameter b varies....224

B.39 TCC EOS; n-decane; % deviation of thermodynamic properties as parameter c varies....226

B.40 TCC EOS; methanol; % deviation of thermodynamic properties as parameter a(T) varies....228

B.41 TCC EOS; methanol; % deviation of thermodynamic properties as parameter b varies....230

B.42 TCC EOS; methanol; % deviation of thermodynamic properties as parameter c varies....232

B.43 TCC EOS; ethanol; % deviation of thermodynamic properties as parameter a(T) varies....234

B.44 TCC EOS; ethanol; % deviation of thermodynamic properties as parameter b varies....236

B.45 TCC EOS; ethanol; % deviation of thermodynamic properties as parameter c varies....238

TABLE PAGE

B.46 TCC EOS; methane, n-nonane, and n-decane; % deviation of vapor pressure as parameters a(T), b, and c varie....240

B.47 TCC EOS; methane, n-nonane, n-decane, methanol, and ethanol; vapor and liquid compressibility factor, vapor and liquid fugacity coefficient, and vapor pressure....242

B.48 SBC EOS; methane; % deviation of thermodynamic properties as parameter a(T) varies....244

B.49 SBC EOS; methane; % deviation of thermodynamic properties as parameter β(T) varies....246

B.50 SBC EOS; methane; % deviation of thermodynamic properties as parameter c(T) varies....248

B.51 SBC EOS; methane; % deviation of thermodynamic properties as parameter e varies....250

B.52 SBC EOS; n-nonane; % deviation of thermodynamic properties as parameter a(T) varies....252

B.53 SBC EOS; n-nonane; % deviation of thermodynamic properties as parameter β(T) varies....254

B.54 SBC EOS; n-nonane; % deviation of thermodynamic properties as parameter c(T) varies....256

B.55 SBC EOS; n-nonane; % deviation of thermodynamic properties as parameter e varies....258

B.56 SBC EOS; n-decane; % deviation of thermodynamic properties as parameter a(T) varies....260

B.57 SBC EOS; n-decane; % deviation of thermodynamic properties as parameter β(T) varies....262

B.58 SBC EOS; n-decane; % deviation of thermodynamic properties as

TABLE PAGE

parameter c(T) varies....264

B.59 SBC EOS; n-decane; % deviation of thermodynamic properties as parameter e varies....266

B.60 SBC EOS; methane, n-nonane, and n-decane; % deviation of vapor pressure as parameters a(T), β(T) , c(T), and e varie....268

B.61 SBC EOS; methane, n-nonane, and n-decane; vapor and liquid compressibility factor, vapor and liquid fugacity coefficient, and vapor pressure....270

B.62 SRK EOS; 0.5methane[1]/0.5n-heptane[2]; % deviation of parameter as a(T) and b as fundamental properties varie....271

B.63 SRK EOS; 0.5methane[1]/0.5n-decane[2]; % deviation of parameter a(T) and b as fundamental properties varie....271

B.64 SRK EOS; 0.5CO_2[1]/0.5n-heptane[2]; % deviation of parameter a(T) and b as fundamental properties varie....271

B.65 SRK EOS; 0.5ethanol[1]/0.5benzene[2]; % deviation of parameter a(T) and b as fundamental properties varie....272

B.66 SRK EOS; 0.5methanol[1]/0.5H_2O[2]; % deviation of parameter a(T) and b as fundamental properties varie....272

B.67 SRK EOS; 0.5methanol[1]/0.5ethanol[2]; % deviation of parameter a(T) and b as fundamental properties varie....272

B.68 PR EOS; 0.5methane[1]/0.5n-heptane[2]; % deviation of parameter a(T) and b as fundamental properties varie....273

B.69 PR EOS; 0.5methane[1]/0.5n-decane[2]; % deviation of parameter a(T) and b as fundamental properties varie....273

B.70 PR EOS; 0.5CO_2[1]/0.5n-heptane[2]; % deviation of parameter a(T) and b as fundamental properties varie....273

TABLE PAGE

B.71 PR EOS; 0.5ethanol[1]/0.5benzene[2]; % deviation of parameter a(T) and b as fundamental properties varie.....274

B.72 PR EOS; 0.5methanol[1]/0.5H_2O[2]; % deviation of parameter a(T) and b as fundamental properties varie.....274

B.73 PR EOS; 0.5methanol[1]/0.5ethanol[2]; % deviation of parameter a(T) and b as fundamental properties varie.....274

B.74 ALS EOS; 0.5methane[1]/0.5n-heptane[2]; % deviation of parameter a(T) and b_1, $b_{2,,}$ and b_3 as fundamental properties varie.....275

B.75 ALS EOS; 0.5methane[1]/0.5n-decane[2]; % deviation of parameter a(T) and b_1, $b_{2,,}$ and b_3 as fundamental properties varie.....275

B.76 ALS EOS; 0.5CO_2[1]/0.5n-heptane[2]; % deviation of parameter a(T) and b_1, $b_{2,,}$ and b_3 as fundamental properties varie.....275

B.77 ALS EOS; 0.5ethanol[1]/0.5benzene[2]; % deviation of parameter a(T) and b_1, $b_{2,,}$ and b_3 as fundamental properties varie.....276

B.78 ALS EOS; 0.5methanol[1]/0.5H_2O[2]; % deviation of parameter a(T) and b_1, $b_{2,,}$ and b_3 as fundamental properties varie.....276

B.79 ALS EOS; 0.5methanol[1]/0.5ethanol[2]; % deviation of parameter a(T) and b_1, $b_{2,,}$ and b_3 as fundamental properties varie.....276

B.80 TCC EOS; 0.5benzene[1]/0.5cyclohexane[2]; % deviation of parameter a(T), b(T), and c as fundamental properties varie.....277

B.81 TCC EOS; 0.5ethanol[1]/0.5benzene[2]; % deviation of parameter a(T), b(T), and c as fundamental properties varie.....277

B.82 TCC EOS; 0.5acetone[1]/0.5H_2O[2]; % deviation of parameter a(T), b(T), and c as fundamental properties varie.....277

B.83 SBC EOS; methane; % deviation of parameter a(T), β(T), c(T), and e as fundamental properties varie.....278

TABLE PAGE

B.84 SBC EOS; n-nonane; % deviation of parameter a(T), β(T), c(T), and e as fundamental properties varie.....278

B.85 SBC EOS; n-decane; % deviation of parameter a(T), β(T), c(T), and e as fundamental properties varie.....278

LISTS OF FIGURES

FIGURE **PAGE**

4.1 Methanol/n-heptane system; comparison of predicted T-x and T-y curves (lines) with experimental data (symbols) at 760 mmHg from Budantseva, l.S., Lestex, T.M., and Nemstov, M.S., Zh. Fiz. Khim., 49, 1844(1975).....40

6.1a PR EOS; n-nonane; at $0.3T_b$, 1 atm; % deviation of thermodynamic properties as parameter a(T) varie.....85

6.1b PR EOS; n-nonane; at $0.3T_b$, 1 atm; % deviation of thermodynamic properties (fugacity coeff.) parameter a(T) varie.....86

6.2a PR EOS; n-nonane; at T_b, 1 atm; % deviation of thermodynamic properties as parameter a(T) varie.....87

6.2b PR EOS; n-nonane; at T_b, 1 atm; % deviation of thermodynamic properties as parameter a(T) varie.....88

6.3a PR EOS; n-nonane; at $0.8T_c$, 1 atm; % deviation of thermodynamic properties as parameter a(T) varie.....89

6.3b PR EOS; n-nonane; at $0.8T_c$, 1 atm; % deviation of thermodynamic properties (ϕ_i,K_i) as parameter a(T) varie.....90

6.4a PR EOS; n-nonane; at T_c, 1 atm; % deviation of thermodynamic properties as parameter a(T) varie.....91

6.4b PR EOS; n-nonane; at T_c, 1 atm; % deviation of thermodynamic properties (dH,dS) as parameter a(T) varie.....92

6.5 PR EOS; n-nonane; at $1.2T_c$, 1 atm; % deviation of thermodynamic properties as parameter a(T) varie.....93

6.6 PR EOS; n-nonane; at T_b, $0.8P_c$; % deviation of thermodynamic properties as parameter a(T) varie.....94

FIGURE PAGE

6.7 PR EOS; n-nonane; at $0.8T_c$, $0.8P_c$; % deviation of thermodynamic properties as parameter a(T) varie....95

6.8 PR EOS; n-nonane; at T_c, $0.8P_c$; % deviation of thermodynamic properties as parameter a(T) varie....96

6.9 PR EOS; n-nonane; at $1.2T_c$, $0.8P_c$; % deviation of thermodynamic properties as parameter a(T) varie....97

6.10 PR EOS; n-nonane; at T_c, $1.2P_c$; % deviation of thermodynamic properties as parameter a(T) varie....98

6.11a PR EOS; n-nonane; at $0.3T_b$, 1 atm; % deviation of thermodynamic properties as parameter b varie....99

6.11b PR EOS; n-nonane; at $0.3T_b$, 1 atm; % deviation of thermodynamic properties (fugacity coeff.) parameter b varie....100

6.12a PR EOS; n-nonane; at T_b, 1 atm; % deviation of thermodynamic properties as parameter b varie....101

6.12b PR EOS; n-nonane; at T_b, 1 atm; % deviation of thermodynamic properties as parameter b varie....102

6.13a PR EOS; n-nonane; at $0.8T_c$, 1 atm; % deviation of thermodynamic properties as parameter b varie....103

6.13b PR EOS; n-nonane; at $0.8T_c$, 1 atm; % deviation of thermodynamic properties (ϕ_i,K_i) as parameter b varie....104

6.14a PR EOS; n-nonane; at T_c, 1 atm; % deviation of thermodynamic properties as parameter b varie....105

6.4b PR EOS; n-nonane; at T_c, 1 atm; % deviation of thermodynamic properties (dH,dS) as parameter b varie....106

FIGURE PAGE

6.15 PR EOS; n-nonane; at $1.2T_c$, 1 atm; % deviation of thermodynamic properties as parameter b varie.....107

6.16 PR EOS; n-nonane; at T_b, $0.8P_c$; % deviation of thermodynamic properties as parameter b varie.....108

6.17 PR EOS; n-nonane; at $0.8T_c$, $0.8P_c$; % deviation of thermodynamic properties as parameter b varie.....109

6.18 PR EOS; n-nonane; at T_c, $0.8P_c$; % deviation of thermodynamic properties as parameter b varie.....110

6.19 PR EOS; n-nonane; at $1.2T_c$, $0.8P_c$; % deviation of thermodynamic properties as parameter b varie.....111

6.20 PR EOS; n-nonane; at T_c, $1.2P_c$; % deviation of thermodynamic properties as parameter b varie.....112

6.21 PR EOS; 0.5methane[1]/0.5n-heptane; at $0.3T_b$; % deviation of parameter a(T) as fundamental properties varie.....113

6.22 PR EOS; 0.5methane[1]/0.5n-heptane; at T_b; % deviation of parameter a(T) as fundamental properties varie.....114

6.23 PR EOS; 0.5methane[1]/0.5n-heptane; at $0.8T_c$; % deviation of parameter a(T) as fundamental properties varie.....115

6.24 PR EOS; 0.5methane[1]/0.5n-heptane; at T_c; % deviation of parameter a(T) as fundamental properties varie.....116

6.25 PR EOS; 0.5methane[1]/0.5n-heptane; at $1.2T_c$; % deviation of parameter a(T) as fundamental properties varie.....117

6.26 PR EOS; 0.5methane[1]/0.5n-heptane; % deviation of parameter b as fundamental properties varie.....118

LIST OF SYMBOLS

EOS:	Equation Of State
SRK:	Soave-Redlich-Kwong
PR:	Peng-Robinson
ALS:	Adachi-Lu-Sugie
TCC:	Twu-Coon-Cunningham
SBC:	Shah-Bienkowski-Cochran
P:	pressure
R:	universal gas constant
T:	temperature
υ:	molar volume
Z:	compressibilty factor
x_i:	mole fraction of component i
k_{ij}:	binary interaction parameter
dH:	enthalpy departure
dS:	entropy departure
ϕ_i:	fugacity coefficient of component i
K_i:	equilibrium ratio of component i
P^{sat}:	saturated vapor pressure
a(T):	EOS parameter
b:	van der Waals volume in SRK and PR
A, B:	SRK and PR reduced parameters for a, and b
m:	EOS parameter in SRK, PR, and ALS
b_i:	ALS EOS parameters
B_i:	ALS reduced parameters for b_i
C:	ALS molar volume correction parameter

d_i:	ALS constants in Equations (4-32) to (4-34)
MW:	molecular weight, g/mol
SG:	specific gravity at T=288.15 K and P=0.101325 MPa
b, c:	TCC EOS parameters
A, B, C:	TCC reduced parameters for a, b, and c respectively
L, M, N:	TCC parameters in the alpha function
c, e:	SBC EOS parameters
k_0, k_1,:	SBC constants
X_i:	SBC constants of component i

Greek letters

ω:	acentric factor
α:	temperature dependence of parameter a(T)
β_i:	ALS EOS parameters
Ω:	ALS EOS parameters
β_{ij}:	TCC binary interaction parameter
ε_i:	composition-dependent term in the mixing rule
$\beta(T)$:	TCC hard-core volume
$\xi(T_r)$:	TCC temperature dependence of parameter c
ρ:	density, mol/dm^3

superscripts and subscripts

c:	critical property
i, j:	property of component i, j
ij:	property of i-j interaction
r:	reduced property
V:	vapor phase
L	liquid phase