

อิทธิพลของค่าตัวแปรเสริมในสมการสถานะที่มีต่อค่าสมบัติทางเทอร์โมไดนามิกส์

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INFLUENCE OF PARAMETERS IN EQUATIONS OF STATE ON  
THERMODYNAMIC PROPERTIES

MISS SUPINDA WADSONTAD

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                                  Thermodynamic Properties  
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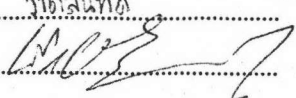
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พิมพ์ต้นฉบับบทความวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

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การหาอิทธิพลของค่าตัวแปรเสริมในสมการสถานะ ที่มีต่อค่าสมบัติทางเทอร์โมไดนามิกส์ โดยศึกษา  
จากสมการสถานะดังต่อไปนี้ 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 ค่าตัวแปรเสริมมีผลต่อค่าสมบัติทางเทอร์โมไดนามิกส์ในสมการสถานะที่ใช้ศึกษาค่อนข้างใกล้เคียง  
กัน โดยเรียงลำดับอิทธิพลของค่าตัวแปรเสริมที่มีต่อค่าสมบัติทางเทอร์โมไดนามิกส์จากมากไปหาน้อยได้ ดังนี้  
 $SBC > ALS \geq PR \geq SRK > TCC$ .

ภาควิชา ..... วิศวกรรมเคมี  
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ลายมือชื่ออาจารย์ที่ปรึกษา .....   
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม .....

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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:  $SBC > ALS \geq PR \geq SRK > TCC$ .

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ลายมือชื่ออาจารย์ที่ปรึกษา

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม



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## 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
$v$ :	molar volume
Z:	compressibility factor
$x_i$ :	mole fraction of component $i$
$k_{ij}$ :	binary interaction parameter
dH:	enthalpy departure
dS:	entropy departure
$\phi_i$ :	fugacity coefficient of component $i$
$K_i$ :	equilibrium ratio of component $i$
$P^{\text{sat}}$ :	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*

$\omega$ :	acentric factor
$\alpha$ :	temperature dependence of parameter a(T)
$\beta_i$ :	ALS EOS parameters
$\Omega$ :	ALS EOS parameters
$\beta_{ij}$ :	TCC binary interaction parameter
$\varepsilon_i$ :	composition-dependent term in the mixing rule
$\beta(T)$ :	TCC hard-core volume
$\xi(T_r)$ :	TCC temperature dependence of parameter c
$\rho$ :	density, mol/dm <sup>3</sup>

*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