

สมบัติสารละลายน้ำ-ลิเทียมโบรไมด์

เอนทัลปี ความเข้มข้นสารละลาย และอุณหภูมิสารละลายน้ำ-ลิเทียมโบรไมด์ [ASHRAE, 2009]

สำหรับ ความเข้มข้น (Concentration) $X < 40$ (%LiBr)

อุณหภูมิสารละลาย (Solution temperature) $15 < T < 165$ (°C)

$$h = 21.4817157 - 2.38366711(X) + 3.90458186(T) + 0.03625001(X^2) + 5.25010607 \times 10^{-4}(T^2) - 0.0369249939(TX), \text{ (kJ/kg)}$$

สำหรับ ความเข้มข้น (Concentration) $40 \leq X < 70$ (%LiBr)

อุณหภูมิสารละลาย (Solution temperature) $15 < T < 165$ (°C)

$$h = \sum_0^4 A_n X^n + T \sum_0^4 B_n X^n + T^2 \sum_0^4 C_n X^n \text{ (kJ/kg)}$$

เมื่อ	$A_0 = -2024.33$	$B_0 = 18.2829$	$C_0 = -3.7008214 \text{ E-2}$
	$A_1 = 163.309$	$B_1 = -1.1691757$	$C_1 = 2.8877666 \text{ E-3}$
	$A_2 = -4.88161$	$B_2 = 3.248041 \text{ E-2}$	$C_2 = -8.1313015 \text{ E-5}$
	$A_3 = 6.302948 \text{ E-2}$	$B_3 = -4.034184 \text{ E-4}$	$C_3 = 9.9116628 \text{ E-7}$
	$A_4 = -2.913705 \text{ E-4}$	$B_4 = 1.8520569 \text{ E-6}$	$C_4 = -4.4441207 \text{ E-9}$

การพัฒนารหัสทางคอมพิวเตอร์

Function $hWL(\text{TempAqLiBr}, X\text{LiBr})$ As Variant 'kJ/kg

Dim TT As Double 'C

Dim XX As Double %LiBr

Dim hh As Double 'kJ/kg

Dim A0, a1, a2, A3, A4, B0, b1, b2, B3, B4, C0, C1, C2, C3, C4 as Double

A0 = -2024.33

a1 = 163.309

a2 = -4.88161

A3 = 6.302948 / 100

A4 = -2.913705 / 10000

B0 = 18.2829

b1 = -1.1691757

b2 = 3.248041 / 100

B3 = -4.034184 / 10000

B4 = 1.8520569 / 1000000

$$C0 = -3.7008214 / 100$$

$$C1 = 2.8877666 / 1000$$

$$C2 = -8.1313015 / 100000$$

$$C3 = 9.9116628 / 10000000$$

$$C4 = -4.4441207 / 1000000000$$

"Calculate"

TT = TempAqLiBr 'C

XX = XLiBr %LiBr

If 15 < TT And TT < 165 Then

If 40 < XX And XX < 70 Then

$$hh = A0 * (XX^0) + a1 * (XX^1) + a2 * (XX^2) + A3 * (XX^3) + A4 * (XX^4) + TT * (B0 * (XX^0) + b1 * (XX^1) + b2 * (XX^2) + B3 * (XX^3) + B4 * (XX^4)) + (TT^2) * (C0 * (XX^0) + C1 * (XX^1) + C2 * (XX^2) + C3 * (XX^3) + C4 * (XX^4)) \quad \%J/kg$$

GoTo Outstate

ElseIf 0 < XX And XX <= 40 Then

$$hh = 21.4817157 - 2.38366711 * XX + 3.90458186 * TT + 0.03625001 * (XX^2) + 5.25010607 * (10^{-4}) * (TT^2) - 0.0369249939 * TT * XX$$

GoTo Outstate

ElseIf 70 <= XX And XX <= 100 Then

$$hh = 0$$

GoTo Outstate

End If

ElseIf -100 < TT And TT <= 15 Then

If 40 < XX And XX < 70 Then

$$hh = 0$$

GoTo Outstate

ElseIf 0 < XX And XX <= 40 Then

$$hh = 0$$

GoTo Outstate

ElseIf 70 <= XX And XX <= 100 Then

$$hh = 0$$

GoTo Outstate

End If

ElseIf $165 \leq TT$ And $TT < 500$ Then

If $40 < XX$ And $XX < 70$ Then

$hh = 0$

GoTo Outstate

ElseIf $0 < XX$ And $XX \leq 40$ Then

$hh = 0$

GoTo Outstate

ElseIf $70 \leq XX$ And $XX \leq 100$ Then

$hh = 0$

GoTo Outstate

End If

End If

Outstate:

If $hh = 0$ Then

$hWL = \text{"Out of range"}$

Else

$hWL = hh$ 'kJ/kg

End If

End Function

อุณหภูมิสารละลาย อุณหภูมิสารทำงาน และความดันสารละลายน้ำ-ลิเทียมโบรไมด์ [ASHRAE, 2009]

สำหรับ อุณหภูมิสารทำงาน (Refrigerant temperature) $-15 < T_{ref} < 110$ (°C)

อุณหภูมิสารละลาย (Solution temperature) $5 < T < 175$ (°C)

ความเข้มข้น (Concentration) $45 < X < 70$ (%LiBr)

$$T = \sum_0^3 B_n X^n + T_{ref} \sum_0^3 A_n X^n \text{ (°C)}$$

$$T_{ref} = (T - \sum_0^3 B_n X^n) / \sum_0^3 A_n X^n \text{ (°C)}$$

$$\log(P) = C + D/T_{ref} + E/T_{ref}^2 \text{ (P = kPa, } T_{ref} = \text{K)}$$

$$T_{ref} = -2E / [D + (D^2 - 4E[C - \log(P)])^{0.5}] \text{ (P = kPa, } T_{ref} = \text{K)}$$

เมื่อ	$A_0 = -2.00755$	$B_0 = 124.937$	$C = 7.05$
	$A_1 = 0.16976$	$B_1 = -7.71649$	$D = -1596.49$
	$A_2 = -3.133362 \text{ E-3}$	$B_2 = 0.152286$	$E = -104095.5$
	$A_3 = 1.97668 \text{ E-5}$	$B_3 = -7.9509 \text{ E-4}$	

การพัฒนารหัสทางคอมพิวเตอร์

“อุณหภูมิสารละลาย (Solution temperature) จากอุณหภูมิสารทำงานและความเข้มข้น”

Function SolT(TempRef, XLiBr) As Variant 'C

Dim TTT As Double 'C

Dim XXX As Double %LiBr

Dim TestSolT As Double

Dim AA0, AA1, AA2, AA3, BB0, BB1, BB2, BB3, CC, dd, ee As Double

AA0 = -2.00755

AA1 = 0.16976

AA2 = -3.133362 / 1000

AA3 = 1.97668 / 100000

BB0 = 124.937

BB1 = -7.71649

BB2 = 0.152286

BB3 = -7.9509 / 10000

CC = 7.05

dd = -1596.49

ee = -104095.5

"Calculate"

$TTT = TempRef$ 'C

$XXX = XLiBr$ %LiBr

If $-15 \leq TTT$ And $TTT \leq 110$ Then

If $45 \leq XXX$ And $XXX \leq 70$ Then

$TestSolT = BB0 * (XXX^0) + BB1 * (XXX^1) + BB2 * (XXX^2) + BB3 * (XXX^3) + (TTT * (AA0 * (XXX^0) +$
 $AA1 * (XXX^1) + AA2 * (XXX^2) + AA3 * (XXX^3)))$

GoTo Outstat

ElseIf $XXX < 45$ Then

$TestSolT = 0$

GoTo Outstat

ElseIf $70 < XXX$ Then

$TestSolT = 0$

GoTo Outstat

End If

ElseIf $TTT < -15$ Then

If $45 \leq XXX$ And $XXX \leq 70$ Then

$TestSolT = 0$

GoTo Outstat

ElseIf $XXX < 45$ Then

$TestSolT = 0$

GoTo Outstat

ElseIf $70 < XXX$ Then

$TestSolT = 0$

GoTo Outstat

End If

ElseIf $110 < TTT$ Then

If $45 \leq XXX$ And $XXX \leq 70$ Then

$TestSolT = 0$

GoTo Outstat

ElseIf $XXX < 45$ Then

$TestSolT = 0$

GoTo Outstat

ElseIf 70 < XXX Then

TestSolT = 0

GoTo Outstat

End If

End If

Outstat:

If TestSolT = 0 Then

SolT = "Out of range" 'C

Else

SolT = TestSolT 'C

End If

End Function

“อุณหภูมิสารละลาย (Solution temperature) จากเอนทัลปีสารละลายและความเข้มข้น”

```
Function SolTh(Refh, XLiBr) As Variant    'C
    Dim TT As Double        'kJ/kg
    Dim XX As Double        '%LiBr
    Dim hh As Double        'kJ/kg
    Dim A0, a1, a2, A3, A4, B0, b1, b2, B3, B4, C0, C1, C2, C3, C4, TestA, TestB, TestC, TestD, TestE, TestF As Double
    A0 = -2024.33
    a1 = 163.309
    a2 = -4.88161
    A3 = 6.302948 / 100
    A4 = -2.913705 / 10000
    B0 = 18.2829
    b1 = -1.1691757
    b2 = 3.248041 / 100
    B3 = -4.034184 / 10000
    B4 = 1.8520569 / 1000000
    C0 = -3.7008214 / 100
    C1 = 2.8877666 / 1000
    C2 = -8.1313015 / 100000
    C3 = 9.9116628 / 10000000
    C4 = -4.4441207 / 1000000000
    "Calculate"
    hh = Refh        'kJ/kg
    XX = XLiBr        '%LiBr
    TestC = A0 * (XX ^ 0) + a1 * (XX ^ 1) + a2 * (XX ^ 2) + A3 * (XX ^ 3) + A4 * (XX ^ 4) - hh
    TestB = (B0 * (XX ^ 0) + b1 * (XX ^ 1) + b2 * (XX ^ 2) + B3 * (XX ^ 3) + B4 * (XX ^ 4))
    TestA = (C0 * (XX ^ 0) + C1 * (XX ^ 1) + C2 * (XX ^ 2) + C3 * (XX ^ 3) + C4 * (XX ^ 4))
    TestD = (TestB ^ 2) - 4 * TestA * TestC
    TestE = (-TestB + Sqr(TestD)) / (2 * TestA)    'C
    TestF = (-TestB - Sqr(TestD)) / (2 * TestA)    'C
    If TestE > 15 And TestF > 15 Then
        TT = "Out of range"
    ElseIf TestE > 15 And TestF <= 15 Then
```

```
If 165 <= TestE Then
    TT = "Out of range"
Else
    TT = TestE      'C
End If
ElseIf TestF > 15 And TestE <= 15 Then
    If 165 <= TestF Then
        TT = "Out of range"
    Else
        TT = TestF      'C
    End If
End If
SolTh = TT      'C
End Function
```


“อุณหภูมิสารทำงาน (Refrigerant temperature)”

```

Function RefT(TempAqLiBr, XLiBr) As Variant    'C
    Dim TTT As Double                        'C
    Dim XXX As Double                        %LiBr
    Dim TestSolT As Double

    Dim AA0, AA1, AA2, AA3, BB0, BB1, BB2, BB3, CC, dd, ee As Double

    AA0 = -2.00755
    AA1 = 0.16976
    AA2 = -3.133362 / 1000
    AA3 = 1.97668 / 100000
    BB0 = 124.937
    BB1 = -7.71649
    BB2 = 0.152286
    BB3 = -7.9509 / 10000
    CC = 7.05
    dd = -1596.49
    ee = -104095.5

    "Calculate"

    TTT = TempAqLiBr    'C
    XXX = XLiBr        %LiBr

    If 5 <= TTT And TTT <= 175 Then

        If 45 <= XXX And XXX <= 70 Then

            TestSolT = (TTT - (BB0 * (XXX ^ 0) + BB1 * (XXX ^ 1) + BB2 * (XXX ^ 2) + BB3 * (XXX ^ 3))) / (AA0 * (XXX ^ 0)
            + AA1 * (XXX ^ 1) + AA2 * (XXX ^ 2) + AA3 * (XXX ^ 3))

            GoTo Outstat

        ElseIf XXX < 45 Then

            TestSolT = 0

            GoTo Outstat

        ElseIf 70 < XXX Then

            TestSolT = 0

            GoTo Outstat

        End If

    ElseIf TTT < 5 Then
    
```

If 45 <= XXX And XXX <= 70 Then

TestSolT = 0

GoTo Outstat

ElseIf XXX < 45 Then

TestSolT = 0

GoTo Outstat

ElseIf 70 < XXX Then

TestSolT = 0

GoTo Outstat

End If

ElseIf 175 < TTT Then

If 45 <= XXX And XXX <= 70 Then

TestSolT = 0

GoTo Outstat

ElseIf XXX < 45 Then

TestSolT = 0

GoTo Outstat

ElseIf 70 < XXX Then

TestSolT = 0

GoTo Outstat

End If

End If

Outstat:

If TestSolT = 0 Then

RefT = "Out of range" 'C

Else

RefT = TestSolT 'C

End If

End Function

“ความดันอิ่มตัวจากอุณหภูมิสารทำงาน (Saturated pressure from refrigerant temperature)”

```

Function RefP(TempRef) As Variant      'kPa
    Dim TTT As Double                  'K
    Dim TestSolT As Double
    Dim TestSolT1 As Double
    Dim CC As Double
    Dim dd As Double
    Dim ee As Double
    Dim TestA As Double
    Dim TestB As Double
    CC = 7.05
    dd = -1596.49
    ee = -104095.5
    "Calculate"
    TTT = TempRef + 273.15              'K
    TestA = -15 + 273.15                'K
    TestB = 110 + 273.15                'K
    If TestA < TTT And TTT < TestB Then
        TestSolT1 = CC + (dd / TTT) + (ee / TTT ^ 2)    'log P
        TestSolT = 10 ^ (TestSolT1)    'P, kPa
        GoTo Outstat
    ElseIf TTT <= TestA Then
        TestSolT = 0
        GoTo Outstat
    ElseIf TestB <= TTT Then
        TestSolT = 0
        GoTo Outstat
    End If
Outstat:
    If TestSolT = 0 Then
        RefP = "Out of range"          'C
    Else
        RefP = TestSolT                 'C
    
```

End If

End Function

“อุณหภูมิสารทำงานจากความดันอิ่มตัว (Refrigerant temperature from saturated pressure)”

```
Function RefT1(PresSS) As Variant    'C
    Dim TTT As Double                'kPa
    Dim TestSolT As Double
    Dim TestSolT1 As Double
    Dim CC As Double
    Dim dd As Double
    Dim ee As Double
    Dim TestA As Double
    CC = 7.05
    dd = -1596.49
    ee = -104095.5
    TTT = PresSS                    'kPa
    TestB = Log10(TTT)
    TestA = (dd ^ 2) - (4 * ee * (CC - TestB))
    TestSolT1 = -2 * ee / (dd + TestA ^ 0.5)    'K
    TestSolT = TestSolT1 - 273.15    'C
    If TestSolT <= -15 And 110 <= TestSolT Then
        RefT1 = "Out of range"    'C
    Else
        RefT1 = TestSolT    'C
    End If
End Function
```

ความหนาแน่นของสารละลายน้ำ-ลิเทียมโบรไมด์ [Khairulin et al., 2006]

สำหรับ อุณหภูมิสารละลาย (Solution temperature) $T < 250$ (°C)

ความเข้มข้น (Concentration) $30 < X < 65$ (%LiBr)

$$\rho(T, m) = \rho_0(T) [1 + d_0(T)m + d_1(T)m^{1.5} + d_2(T)m^2] \text{ (kg/m}^3\text{)}$$

$$m = \frac{(X/100)}{M_s} (1 - [X/100]) \text{ (mole/kg)} \quad d_j(T) = \sum_{i=0}^4 C_{ji} T^i$$

$$\rho_0(T) = \text{Density of pure water (kg/m}^3\text{)} \quad M_s = 0.086845 \text{ (kg/mole)}$$

ตารางที่ 1 ค่าคงที่ C_{ji}

j/i	0	1	2	3	4
0	6.9979 E-2	-9.36591 E-5	1.1770035 E-6	-2.829722 E-9	7.963374 E-12
1	-7.30855 E-3	1.78947 E-5	-3.458841 E-8	-8.88725 E-10	1.085224 E-12
2	1.811867 E-4	-1.9292 E-6	-1.565022 E-8	2.082693 E-10	-3.761121 E-13

การพัฒนารหัสทางคอมพิวเตอร์

Function SolDensity(TempAqLiBr, XLiBr) As Variant 'kJ/kg-°C

Dim TT As Double 'C

Dim XX As Double '%LiBr

Dim hh As Double 'kJ/kg-°C

Dim m As Double 'molality (concentration in mole/kg)

Dim MassW As Double '0.086845 (kg/mole)

Dim C00, C01, C02, C03, C04, C10, C11, C12, C13, C14, C20, C21, C22, C23, C24, DenW0, D0, d1, d2 As Double

MassW = 0.086845 '(kg/mole)

$$C00 = 6.9979 * 10^{-2}$$

$$C01 = -9.36591 * 10^{-5}$$

$$C02 = 1.1770035 * 10^{-6}$$

$$C03 = -2.829722 * 10^{-9}$$

$$C04 = 7.963374 * 10^{-12}$$

$$C10 = -7.30855 * 10^{-3}$$

$$C11 = 1.78947 * 10^{-5}$$

$$C12 = -3.458841 * 10^{-8}$$

$$C13 = -8.88725 * 10^{-10}$$

$$C14 = 1.085224 * 10^{-12}$$

$$C20 = 1.811867 * 10^{-4}$$

$$C21 = -1.9292 * 10^{-6}$$

$$C22 = -1.565022 * 10^{-8}$$

$$C23 = 2.082693 * 10^{-10}$$

$$C24 = -3.761121 * 10^{-13}$$

"Calculate"

$$TT = \text{TempAqLiBr} \quad 'C$$

$$XX = \text{XLiBr} \quad \%LiBr$$

$$m = (XX / 100) / \text{MassW} * (1 - (XX / 100)) \quad 'molality (concentration in mole/kg)$$

"Density of pure water from REFPROP"

$$\text{DenW0} = 988 \quad 'kg/m3$$

$$D0 = C00 * (TT^0) + C01 * (TT^1) + C02 * (TT^2) + C03 * (TT^3) + C04 * (TT^4)$$

$$d1 = C10 * (TT^0) + C11 * (TT^1) + C12 * (TT^2) + C13 * (TT^3) + C14 * (TT^4)$$

$$d2 = C20 * (TT^0) + C21 * (TT^1) + C22 * (TT^2) + C23 * (TT^3) + C24 * (TT^4)$$

If 0 <= TT And TT <= 250 Then

If 30 <= XX And XX <= 70 Then

$$hh = \text{DenW0} * (1 + D0 * m + d1 * (m^{1.5}) + d2 * (m^2)) \quad 'kJ/kg$$

GoTo Outstate

ElseIf XX < 30 Then

$$hh = 0$$

GoTo Outstate

ElseIf 70 < XX Then

$$hh = 0$$

GoTo Outstate

End If

ElseIf -100 < TT And TT < 0 Then

If 30 <= XX And XX <= 70 Then

$$hh = 0$$

GoTo Outstate

ElseIf XX < 30 Then

$$hh = 0$$

```
GoTo Outstate
ElseIf 70 < XX Then
    hh = 0
    GoTo Outstate
End If
ElseIf 250 < TT And TT < 500 Then
    If 30 <= XX And XX <= 70 Then
        hh = 0
        GoTo Outstate
    ElseIf XX < 30 Then
        hh = 0
        GoTo Outstate
    ElseIf 70 < XX Then
        hh = 0
        GoTo Outstate
    End If
End If
Outstate:
If hh = 0 Then
    SolDensity = "Out of range"
Else
    SolDensity = hh      'kJ/kg
End If
End Function
```


เอนโทรปีของสารละลายน้ำ-ลิเทียมโบรไมด์ [Feuerecker, 1993]

สำหรับ อุณหภูมิสารละลาย (Solution temperature) $40 < T < 210$ (°C)

ความเข้มข้น (Concentration) $40 < X < 65$ (%LiBr)

$$s = \sum_{i=0}^3 \sum_{j=0}^3 B_{ij} X^j T^i \text{ (kJ/kg}\cdot\text{K)}$$

ตารางที่ 2 ค่าคงที่ B_{ij}

i	B_{i0}	B_{i1}	B_{i2}	B_{i3}
0	5.127558 E-01	-1.393954 E-02	2.924145 E-05	9.035697 E-07
1	1.226780 E-02	-9.156820 E-05	1.820453 E-08	-7.991806 E-10
2	-1.364895 E-05	1.068904 E-07	-1.381109 E-09	1.529784 E-11
3	1.021501 E-08	0	0	0

การพัฒนารหัสทางคอมพิวเตอร์

Function SolEntropy(TempAqLiBr, XLiBr) As Variant 'kJ/kg-'C

Dim TT As Double 'C

Dim XX As Double %LiBr

Dim hh As Double 'kJ/kg-'C

Dim hh0, hh1, hh2, hh3, B00, B01, B02, B03, B10, B11, B12, B13, B20, B21, B22, B23, B30, B31, B32, B33, a1, a2, A3, A4, A5, A6, A7, A8, A9, A10 As Double

B00 = 5.127558 / 10

B01 = -1.393954 / 100

B02 = 2.924145 / 100000

B03 = 9.035697 / 10000000

B10 = 1.22678 / 100

B11 = -9.15682 / 100000

B12 = 1.820453 / 100000000

B13 = -7.991806 / 10000000000#

B20 = -1.364895 / 100000

B21 = 1.068904 / 10000000

B22 = -1.381109 / 1000000000

B23 = 1.529784 / 100000000000#

B30 = 1.021501 / 100000000

```

B31 = 0
B32 = 0
B33 = 0
a1 = -1019.61
a2 = 0.1101529
A3 = -0.0104215
A4 = 103.6935
A5 = -0.0587032
A6 = 0.0000863107
A7 = -3.266802
A8 = -0.000316683
A9 = 0.04100993
A10 = -0.0001790548
TT = TempAqLiBr      'C
XX = XLiBr           %LiBr
"Calculate"
If 0 <= TT And TT < 40 Then
    If 40 <= XX And XX <= 75 Then
        hh0 = (B00 * (XX ^ 0) * (TT ^ 0) + B01 * (XX ^ 1) * (TT ^ 0) + B02 * (XX ^ 2) * (TT ^ 0) + B03 * (XX ^ 3) * (TT ^
        0))
        hh1 = (B10 * (XX ^ 0) * (TT ^ 1) + B11 * (XX ^ 1) * (TT ^ 1) + B12 * (XX ^ 2) * (TT ^ 1) + B13 * (XX ^ 3) * (TT ^
        1))
        hh2 = (B20 * (XX ^ 0) * (TT ^ 2) + B21 * (XX ^ 1) * (TT ^ 2) + B22 * (XX ^ 2) * (TT ^ 2) + B23 * (XX ^ 3) * (TT ^
        2))
        hh3 = (B30 * (XX ^ 0) * (TT ^ 3) + B31 * (XX ^ 1) * (TT ^ 3) + B32 * (XX ^ 2) * (TT ^ 3) + B33 * (XX ^ 3) * (TT ^
        3))
        hh = hh0 + hh1 + hh2 + hh3      'kJ/kg
    GoTo Outstate
ElseIf XX < 40 Then
    hh = 0
    GoTo Outstate
ElseIf 75 < XX Then
    hh = 0

```

GoTo Outstate

End If

ElseIf 40 <= TT And TT <= 210 Then

If 40 <= XX And XX <= 70 Then

hh0 = (B00 * (XX ^ 0) * (TT ^ 0) + B01 * (XX ^ 1) * (TT ^ 0) + B02 * (XX ^ 2) * (TT ^ 0) + B03 * (XX ^ 3) * (TT ^ 0))

hh1 = (B10 * (XX ^ 0) * (TT ^ 1) + B11 * (XX ^ 1) * (TT ^ 1) + B12 * (XX ^ 2) * (TT ^ 1) + B13 * (XX ^ 3) * (TT ^ 1))

hh2 = (B20 * (XX ^ 0) * (TT ^ 2) + B21 * (XX ^ 1) * (TT ^ 2) + B22 * (XX ^ 2) * (TT ^ 2) + B23 * (XX ^ 3) * (TT ^ 2))

hh3 = (B30 * (XX ^ 0) * (TT ^ 3) + B31 * (XX ^ 1) * (TT ^ 3) + B32 * (XX ^ 2) * (TT ^ 3) + B33 * (XX ^ 3) * (TT ^ 3))

hh = hh0 + hh1 + hh2 + hh3 %J/kg

GoTo Outstate

ElseIf XX < 40 Then

hh = 0

GoTo Outstate

ElseIf 70 < XX Then

hh = 0

GoTo Outstate

End If

ElseIf -100 < TT And TT < 0 Then

If 40 <= XX And XX <= 70 Then

hh = 0

GoTo Outstate

ElseIf XX < 40 Then

hh = 0

GoTo Outstate

ElseIf 70 < XX Then

hh = 0

GoTo Outstate

End If

ElseIf 210 < TT And TT < 500 Then

If 40 <= XX And XX <= 70 Then

hh = 0

GoTo Outstate

ElseIf XX < 40 Then

hh = 0

GoTo Outstate

ElseIf 70 < XX Then

hh = 0

GoTo Outstate

End If

End If

Outstate:

If hh = 0 Then

SolEntropy = "Out of range"

Else

SolEntropy = hh 'kJ/kg

End If

End Function

ค่าความจุความร้อนจำเพาะของสารละลายน้ำ-ลิเทียมโบรไมด์

จาก $C_p = A_0 + A_1 X + (B_0 + B_1 X) T$, (kJ/kg·K)

เมื่อ $A_0 = 3.462023$

$B_0 = 1.3499 \times 10^{-3}$

$A_1 = -2.679895 \times 10^{-2}$

$B_1 = -6.55 \times 10^{-6}$

การพัฒนารหัสทางคอมพิวเตอร์

Function CpAqLiBr(TempAqLiBr, XLiBr) As Variant 'kJ/Kg-C

Dim x As Double %

Dim t As Double 'C

Dim X1 As Double

Dim A0 As Double

Dim a1 As Double

Dim B0 As Double

Dim b1 As Double

'''Constant value'''

A0 = 3.462023

a1 = -2.679895 / 100

B0 = 1.3499 / 1000

b1 = -6.55 / 1000000

'''Calculate'''

t = TempAqLiBr 'C

x = XLiBr %

X1 = (A0 + a1 * x) + (B0 + b1 * x) * t 'kJ/kg-'C

CpAqLiBr = X1

End Function

ฟังก์ชันลอการิทึมฐาน 10 (ใช้ในฟังก์ชันความหนาแน่นของสารละลายน้ำ-ลิเทียมโบรไมด์)

"Function convert log(X) is LN to log10(X)"

Function Log10(x)

$$\text{Log10} = \text{Log}(x) / \text{Log}(10)$$

End Function