1、$p_i = p_i^s x_i$

2、$\ln p_i^s = A_i - \frac{B_i}{T+c_I}$

3、$P=p_A+p_B=p_A^s x+p_B^s(1-x)$

4、$v_i=p_i/x_i$

5、$\alpha = \frac{v_A}{v_B} = \frac{(p_A/x_A)}{(p_B/x_B)} = \frac{(y_A/x_A)}{(y_B/x_B)}$

6、$y = \frac{\alpha x}{1+(\alpha-1)x}$

7、$W_1=W_2+W_D$　$W_1x_1=W_2x_2+W_Dx_D$　$D=W1+W2$　$\ln(W_1x_1/W_2x_2)=\alpha\ln(W_1(1-x_1)/W_2(1-x_2))$

$\overline{x_D} = \frac{W_1x_1-W_2x_2}{W_1-W_2}$

8、$F=D+W$　$Fx_F=Dx_D+Wx_W$

9、$\eta = \frac{Dx_D}{Fx_F} * 100\%$　$\eta = \frac{W(1-x_W)}{F(1-x_F)} * 100\%$

10、$y_{n+1} = \frac{R}{R+1}x_n + \frac{x_D}{R+1}$

11、$V=L+D$　$Vy_{n+1}=Lx_n+Dx_D$　$L=RD$　$V=(R+1)D$

12、$y_{n+1} = \frac{L`}{V`}x_m - \frac{Wx_W}{V`} = \frac{V`+W}{V`}x_m - \frac{Wx_W}{V`}$

13、$L`=V`+W$　$L`=L+qF$　$V`=V+(q-1)F$

14、过冷液体($t_F<t_b$)$q = \frac{h_F^v-h_F}{h_F^v-h_F^L} = 1 + \frac{\overline{c_p^L}(t_b-t_F)}{r_F}$

过热气体($t_F>t_d$)$q = \frac{h_F^v-h_F}{h_F^v-h_F^L} = -\frac{\overline{c_p^V}(t_F-t_d)}{r_F}$

15、

进料状态	过冷液体	饱和液体	气液混合物	饱和气体	过热气体
进料温度	$t_F<t_b$	$t_F=t_b$	$t_b<t_F<t_d$	$t_F=t_d$	$t_F>t_d$
q	q>1	q=1	0<q<1	q=0	q<0

16、$y = \frac{q}{q-1}x - \frac{x_F}{q-1}$

17、$E_{mV} = \frac{气相实际增浓程度}{气相理论增浓程度} = \frac{y_n-y_{n+1}}{y_n^*-y_{n+1}}$　$E_{mL} = \frac{液相实际增浓程度}{液相理论增浓程度} = \frac{x_{n-1}-x_n}{x_{n-1}-x_n^*}$　$E_0 = \frac{理论塔板数}{实际板数} = \frac{N}{N_e}$

18、$R_{opt}=(1.1\sim2)R_{min}$

19、$\frac{R_{min}}{R_{min}+1} = \frac{x_D-y_e}{x_D-x_e}$ —— $R_{min} = \frac{x_D-y_e}{y_e-x_e}$ (理想物系)　$R_{min} = \frac{x_D-y_d}{y_d-x_d}$ (非理想物系操作线与平衡线的交点)

20、泡点进料(q=1)　$(R_{min})_{q=1} = \frac{1}{\alpha-1}[\frac{x_D}{x_F} - \frac{\alpha(1-x_D)}{1-x_F}]$

露点进料(q=0)　$(R_{min})_{q=0} = \frac{1}{\alpha-1}(\frac{\alpha x_D}{x_F} - \frac{1-x_D}{1-x_F}) - 1$

21、$R_{min}=q(R_{min})_{q=1}+(1-q)(R_{min})_{q=0}$

22、$N_{\min}=\dfrac{\lg[(\dfrac{x_A}{x_B})_D(\dfrac{x_B}{x_A})_W]}{\lg\overline{\alpha}}$

23、吉利来关联图 $Y=0.75(1-X^{0.5668})$，其中 $X=(R-R_{min})/R+1$，$Y=(N-N_{min})/N+1$ ，该式适用范围为 $X=0.08\sim0.6$ ［N 、N_{min}均包含再沸器在内］

24、$R=[1+\frac{c_p(t_1-t_0)}{r}]R_0$

25、气体通过填料层的压力降 $w_f=\lambda\dfrac{l_e}{d_e}\dfrac{u^2}{2}=\dfrac{\Delta p}{\rho}$

$u=(0.6\sim0.8)u_F$

26、

27、$D=\sqrt{\dfrac{4V_G}{\pi u}}$

28、$\dfrac{F}{S}=\dfrac{\overline{MS}}{\overline{FM}}\qquad\dfrac{R}{E}=\dfrac{\overline{ME}}{\overline{RM}}$

29、$k_A=\dfrac{A在E相中的浓度}{A在R相中的浓度}=\dfrac{y_A}{x_A}$

30、选择性系数 $\beta=\dfrac{k_A}{k_B}=y_A/x_A\Big/y_B/x_B=\dfrac{y'_A/x'_A}{y'_B/x'_b}=\dfrac{y'_A/x'_A}{(1-y'_A)/(1-x'_A)}$

31、$BX_F+SY_S=BX_R+SY_E\quad Y_E=-\dfrac{B}{S}(X_R-X_F)+Y_S\quad Y_E=f(X_R)$

32、$Y_i=-\dfrac{B}{S}(X_i-X_{i-1})+Y_S\qquad Y_i=f(X_i)$

$X_N=\dfrac{X_F-\frac{S}{B}Y_S}{(1+\varepsilon)^N}+\dfrac{Y_S}{m}\qquad N=\dfrac{1}{\ln(1+\frac{mS}{B})}\ln(\dfrac{X_F-Y_S/m}{X_N-Y_S/m})$

33、$B(X_{i-1}-X_N)=S(Y_i-Y_S)\qquad Y_i=\dfrac{B}{S}(X_{i-1}-X_N)+Y_S$

$N=\dfrac{1}{\ln\varepsilon}\ln[(1-\dfrac{1}{\varepsilon})\dfrac{X_F-Y_S/k_A}{X_N-Y_S/k_A}+\dfrac{1}{\varepsilon}]\qquad\varepsilon=\dfrac{k_AS}{B}$

34、$H=0.622\dfrac{p}{P-p}$

35、饱和湿度 $H_s = 0.622\dfrac{p_s}{P-p_s}$

36、相对湿度 $\varphi = \dfrac{p}{p_s}$

37、$H = 0.622\dfrac{\varphi p_s}{P-\varphi p_s}$

38、$\upsilon_H = \dfrac{1kg\text{干空气对应的湿空气的体积}}{1kg\text{干空气}} = (\dfrac{1}{29}+\dfrac{H}{18})\times 22.4\times\dfrac{273+t}{273}\times\dfrac{1.013\times10^5}{P}$

$= (0.772+1.244H)\times\dfrac{273+t}{t}\times\dfrac{1.013\times10^5}{P}$

39、$c_H = c_a + c_v H \approx 1.01+1.88H$

40、$I = I_a + I_v H = (c_a + c_v H)t + r_0 H \quad I \approx (1.01+1.88H)t + 2490H$

41、$t_w = t - \dfrac{k_H r_w}{\alpha}(H_w - H) \quad \dfrac{\alpha}{k_H} \approx c_H \approx 1.09\,kJ/kg\cdot K$

42、$t_{as} = t - \dfrac{r_0}{c_H}(H_{as} - H)$

43、$X = \dfrac{\text{水分质量}}{\text{湿物料中绝干物料的质 量}}\times 100\% \quad \omega = \dfrac{\text{水分质量}}{\text{湿物料的总质量}}\times 100\%$

44、$W = G_1 - G_2 = G_c(X_1 - X_2) = L(H_2 - H_0)$

45、$W = G_c(X_1 - X_2) = G_1\dfrac{\omega_1-\omega_2}{1-\omega_2} = G_2\dfrac{\omega_1-\omega_2}{1-\omega_1}$

46、$G_c = G_1(1-\omega_1) = G_2(1-\omega_2)$

47、$L = \dfrac{W}{H_2 - H_0}$

48、新鲜空气用量 $= L(1+H_0)$

49、$Q_P = L(I_1 - I_0) = Lc_{H_0}(t_1 - t_0) = \mathrm{L(1.01+1.88H_0)(t_1 - t_0)}$

50、$LI_1 + G_1 c_{M_1} t_{M_1} + Q_d = LI_2 + G_2 c_{M_2} t_{M_2} + Q_l$ 也即 $LI_1+G_cI'_1+Q_D=LI_2+G_cI'_2+Q_1$

51、$\mathrm{Q = Q_D + Q_P = L(I_2 - I_0) + G_c(I_2 - I_1) + Q_1}$

52、$\eta = \dfrac{\text{水分蒸发所需要的热量}}{\text{外界所提供的总热量}} * 100\% = \dfrac{Q_W = W(1.88t_2 + 2490 - 4.187\theta_1)}{Q_P + Q_D}$

53、$\eta_{理想}=\dfrac{蒸发水分所需的热量\ Q_{气化}}{输入干燥设备的总热量}\times100\%=\dfrac{Lc_{H_0}(t_1-t_2)}{Lc_{H_0}(t_1-t_0)}\times100\%$　　$\therefore\eta_{理想}=\dfrac{t_1-t_2}{t_1-t_0}\times100\%$

54、$N_A=-\dfrac{G_c dX}{Ad\tau}$

55、$\tau_1=\dfrac{G_c\left(X_1-X_c\right)}{AN_{A,C}}$

56、$N_{A,C}r_w=\alpha\left(t-t_W\right)$　$N_{A,C}=k_H\left(H_W-H\right)$　　***$N_{A,C}$ 即是课本上的 U_c***

57、$\tau_2=\int_0^{\tau_2}d\tau=\dfrac{G_c}{A}\int_{X_2}^{X_c}\dfrac{dX}{N_A}$

58、$\tau_2=\int_0^{\tau_2}d\tau=\dfrac{G_c}{A}\int_{X_2}^{X_c}\dfrac{dX}{N_A}$

斜率　$K_X=\dfrac{N_{A,C}}{X_c-X^*}=\dfrac{N_A}{X-X^*}$　　$\tau_2=\dfrac{G_c\left(X_c-X^*\right)}{AN_{A,C}}\ln\dfrac{X_c-X^*}{X_2-X^*}$　　$\tau_2=\dfrac{G_c X_c}{AN_{A,C}}\ln\dfrac{X_c}{X_2}$