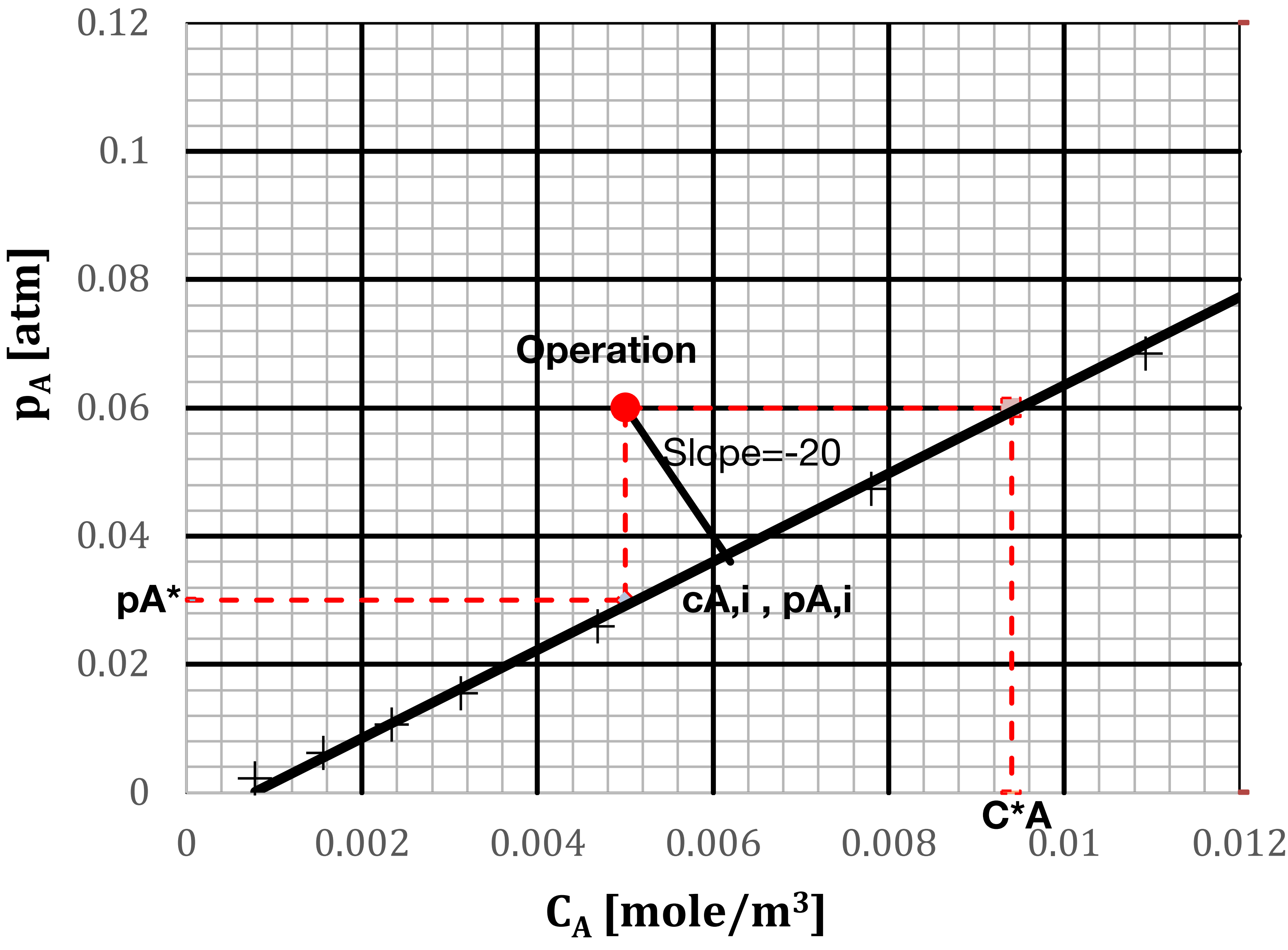
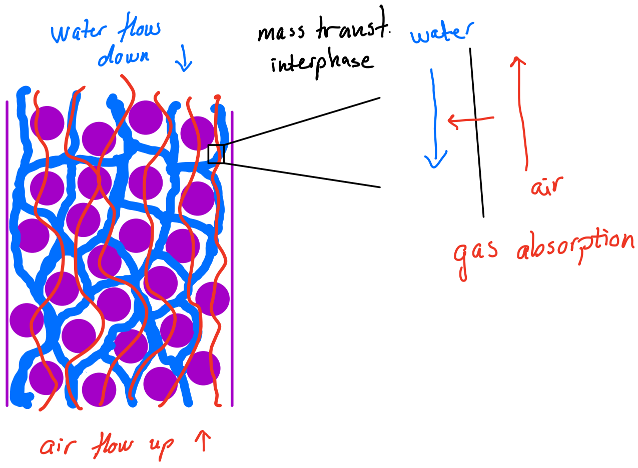


0.12
0.1
0.08
0.06
0.04
0.02
0
p_A [atm]
Operation
Slope=-20
pA*
cA,i , pA,i
C*A
0
0.002
0.004
0.006
0.008
0.01
0.012
C_A [mole/m^3]



$p_A = 0.06$ atm

$C_{AL} = 0.005$ kgmole/m^3

$P = 1.0$ atm

$T = 30°C = 303$ K

$k_L = 12.21 \frac{m}{hr}$

$k_G = 0.610 \frac{kgmole}{m^2\ hr\ atm}$

A. $N_A = k_G(p_A - p_{Ai})$

B. $N_A = k_L(C_{Ai} - C_{AL})$

C. $N_A = K_G(p_A - p_A^*)$ or $N_A = K_L(C_{AL}^* - C_{AL})$

D. read p_A^* and C_{AL}^* from graph

$$\boxed{\begin{aligned} p_A^* &= 0.03 \text{ atm} \\ C_{AL}^* &= 0.0094 \ \frac{kgmole}{m^3} \end{aligned}}$$

p_A^* is the partial pressure in equilibrium with the liquid concentration at the operation con-

C_{AL}^* is the liquid concentration in equilibrium with the partial pressure in the gasphase,

E. draw a line with slope of $-k_L/k_G = -20$

read from graph

$$\boxed{\begin{aligned} p_{Ai} &= 0.036 \text{ atm} \\ C_{Ai} &= 0.0062 \ \frac{kg\ mole}{m^3} \end{aligned}}$$

F. $K_G = \left(\frac{1}{k_G} + \frac{H}{k_L}\right)^{-1}$

$H = p_{Ai}/C_{Ai} = 5.81$ atm m^3/kgmole

$$K_G = \boxed{0.473 \ \frac{kgmole}{m^2\ hr\ atm}}$$

$K_y = K_G P = 0.473 \ \frac{kgmole}{m^2\ hr\ \cancel{atm}}\ 1 \text{ atm} = \boxed{0.473 \ \frac{kgmole}{m^2\ hr\ \cancel{atm}}}$

$$K_L = \left(\frac{1}{k_L} + \frac{1}{H\,k_G}\right)^{-1}$$

$$= \left(\frac{1}{12.21\ \frac{m}{hr}} + \frac{1}{5.81\ \frac{\cancel{atm}\ m^3}{kg\cancel{mole}}\ 0.610\ \frac{kg\cancel{mole}}{\cancel{m^2}\ hr\ \cancel{atm}}}\right)^{-1} = \boxed{2.75\ m/hr}$$

$$K_x = K_L \cdot c = \boxed{152.42\ \frac{kg\,mole}{hr\ m^2}}$$

G.

$$\frac{1/k_G}{1/K_G} = \frac{(0.610)^{-1}}{(0.473)^{-1}} = \boxed{0.78}$$ gas phase resistant

H.

$$N_A = K_G(p_A - p_A^*) = 0.473\ \frac{kg\,mole}{m^2\ hr\ \cancel{atm}}\left(0.06\ \cancel{atm} - 0.03\ \cancel{atm}\right) = \boxed{1.42\times10^{-2}\ \frac{kg\,mole}{m^2\cdot hr}}$$