NOTATION

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A	gaseous species (solute) that is being transferred from gas phase to the liquid phase ; reactive species.
$[A^*]$	concentration of dissolved gas A at the gas liquid interface, k mol/m^3.
a	effective interfacial area per unit packed volume, m^2/m^3.
a_c	effective interfacial area per unit packed volume during chemical absorption, m^2/m^3.
a_d	effective interfacial area per unit packed volume during distillation, m^2/m^3.
a_{dy}	dynamic area per unit packed volume, m^2/m^3.
a_p	effective interfacial area per unit packed volume during physical absorption, m^2/m^3.
a_{st}	static surface area per unit packed volume, m^2/m^3.
a_t	total dry surface area per unit packed volume, m^2/m^3.
a_v	effective interfacial area per unit packed volume during vaporization, m^2/m^3.
a_w	wetted surface area per unit packed volume, m^2/m^3.
[B]	concentration of reactive species in absorption media/solvent, k mol/m^3.
C	proportionality constant in various generalised correlations.
D_L	diffusivity of the dissolved gas A in liquid, m^2/s.
D_B	diffusivity of the reactant B in liquid, m^2/s.

D_G diffusivity of solute gas in gas phase, m^2/s.

D_V diffusivity of solute in vapour phase, m^2/s.

d_p size of packing, also diameter of packing, m.

G superficial gas flow rate, kg/m^2-s

g acceleration due to gravity, m/s^2.

H Henry's law constant for absorption of gases into water, atm/(k mol/m^3).

H' Henry's law constant for absorption of gases into electrolyte solutions, atm/(k mol/m^3).

H_L height of liquid phase transfer unit, m.

H_V height of vapour phase transfer unit, m.

H_{OG} height of overall gas phase transfer unit during absorption, m.

H_{OV} height of overall vapour phase transfer unit during distillation, m.

h Solubility factor in equation (4.10),
$h = h_+ + h_- + h_G$, m^3/k mol.

h_+, h_-, h_G individual contributions of positive ion, negative ion and gas respectively, m^3/k mol.

h_o operating holdup, m^3/m^3.

h_{st} static holdup, m^3/m^3.

I Ionic strength of solution, k ion/m^3.

K_G true overall gas side mass transfer coefficient, k mol/m^2s atm.

k_2 second order rate constant, m^3/k mol -s.

k_3 third order rate constant, $(m^3/k\ mol)^2$ -s.

k_G true gas side mass transfer coefficient, k mol/m^2s atm.

k_L true liquid side mass transfer coefficient during physical absorption, also during distillation, m/s.

k_La volumetric liquid side mass transfer coefficient, s^{-1}.

k_L' liquid side mass transfer coefficient during chemical absorption, m/s.

k_{MEA} rate constant for reaction between carbon dioxide and monoethanolamine, m^3/ k mol-s

k_{NH_3} rate constant for reaction between carbon dioxide and ammonia, m^3/k mol s.

k_{OH^-} rate constant for reaction between carbon dioxide and hydroxyl ion, m^3/k mol s.

k_V true vapour side mass transfer coefficient during distillation, k mol/m^2 s atm.

L superficial liquid flow rate, kg/m^2-s.

M_{avg} average molecular weight of the gas/vapour phase, kg/k mol.

m index of Schmidt number in generalised correlations.

n index of parameters $(\rho_L/\mu_L g)$ & $(a_t\, d_p)$ in generalised correlations for k_L and k_G respectively.

P pressure, atm.

R specific rate of absorption, k mol/m^2-s.

R' volumetric rate of absorption, k mo/m^3-s.

S solubility of gases in liquids, (k mol/m^3)/atm.

T temperature, (°K)

U superficial liquid velocity, (m/s)

Z height of packed bed, m.

SUBSCRIPTS AND ABBREVATIONS.

CBS. ceramic Berl saddle.

chem. chemical absorption.

CRR. ceramic Raschig ring.

dist. distillation.

exp. experimental.

G gas.

L Liquid.

Lit. literature.

obs. observed.

phy. physical absorption.

pred. predicted.

V vapour.

GREEK SYMBOLS

α enhancement factor for interfacial area defined by equation (6.10) ; or index of Reynolds number in generalised correlations, or relative volatility.

β Reaction factor defined by K_L'/K_L ; or index of Weber number in generalised correlations.

γ parameter defined by $\sqrt{D_L K_2 [B]}/k_L$ also known as Hatta number index of Froude number in generalised correlations.

δ index of parameter (σ / σ_c) in generalised correlations.

ε index of the parameter ($RT/a_t D_G$) in generalised correlation, void fraction of packed bed.

λ ratio of the slope of equilibrium line to the slope of operating line.

μ viscosity of liquid/gas/vapour, Ns/m^2 (also mNs/m^2).

ν kinematic viscosity, m^2/s.

ρ density of liquid/gas/vapour, kg/m^3.

σ surface tension, N/m (also mN/m).

σ_c critical surface tension of packing material, N/m (also mN/m).

DIMENSIONLESS NUMBERS

Froude number $Fr = L^2 a_t / \rho_L^2 g$.

Reynold's number $Re = L/a_t \mu_L$, $G/a_t \mu_G$.

Schmidt number $Sc = \mu_L / \rho_L D_L$, $\mu_G / \rho_G D_G$.

Weber number $We = L^2/a_t \rho_L \sigma$.

PERCENTAGE ERRORS

$\%\ E_{avg}$ percentage average error

$$= \left(\frac{1}{n} \sum \frac{\text{exp-pred}}{\text{exp.}}\right) \times 100$$

$\%\ E_{abs}$ percentage absolute error

$$= \left(\frac{1}{n} \sum \left| \frac{\text{exp-pred}}{\text{exp.}} \right| \right) \times 100$$

$\%\ S_{dev}$ percentage standard deviation

$$= \left(\sqrt{S_t/n-1}\right) \times 100.$$

where $S_t = (\varepsilon_i - \bar{\varepsilon})^2$, ε_i = (exp-pred) and $\bar{\varepsilon} = (\sum \varepsilon_i)/n$.