Chapter 4 (Batch-to-Continuous)

Roman symbol	Definition	Units	Comments
a	surface area per unit volume	m^2/m^3	
A	area	m^2	
A/V	surface area of heat transfer to reaction volume	1/m	
c	molar concentration	mol/m^3	
d or D	inner tube diameter	m	
D_{ax}	axial dispersion coefficient	m^2/s	
D_m	mass diffusivity	m^2/s	sometimes also D
E	activation energy	J/mol	
E_{aj}	activation energy of reaction j	J/mol	
ΔH_{rj}	heat or enthalpy of reaction j	J/mol	negative for exothermic reactions, positive for endothermic reactions
k	reaction rate constant at temperature T	variable	units depend on the reaction order
k_0	reaction rate constant at a reference temperature T_0	variable	units depend on the reaction order
k_L	gas/liquid mass transfer coefficient	m/s	
k_s	liquid/solid mass transfer coefficient	m/s	
$k_L a$	volumetric mass transfer coefficient for gas/liquid	1/s	
$k_s a$	volumetric mass transfer coefficient for liquid/solid	1/s	
k_1	reaction rate constant of forwards reaction	variable	units depend on the reaction order
k_{-1}	reaction rate constant of reverse reaction	variable	units depend on the reaction order
K	equilibrium constant at temperature T		
K_0	equilibrium constant at a reference temperature T_0		
L/D	length to internal tube diameter ratio		
p	pressure	Pa	
p_c	critical pressure	Pa	
P	power	W	
P/V	mixing power to volume ratio	W/m^3	
R	universal gas constant	J/K/mol	equal to 8.314 J/K/mol
Re	Reynolds number		
t	time	s	

t_r	reaction time	s	
t_{mx}	mixing time	s	
T	temperature	°C or K	
T_c	critical temperature	°C or K	
T_p	process temperature	°C or K	
T_b	boiling point temperature of solvent	°C or K	
TMR_{ad}	time to maximum rate under adiabatic conditions	s	
ΔT_{ad}	adiabatic temperature rise	°C or K	
U	overall heat transfer coefficient	W/m^2/K	
U_V	overall specific heat transfer coefficient	W/m^3/K	
V	volume	m^3	
V_i	molar volume of species i	m^3/mol	
V_r	reaction volume	m^3/mol	
ΔV_r	volume of reaction	m^3/mol	
ΔV_{sol}	volume of dissolution	m^3/mol	
$V^{\neq}$	volume of the transition state	m^3/mol	
$\Delta V_1^{\neq}$	activation volume; change in volume between reactant(s) and transition state	m^3/mol	sometimes written as $\Delta V^{\neq}$
$\Delta V_{-1}^{\neq}$	change in volume between transition state and product(s)	m^3/mol	
x_s	solubility	g/g or mol/mol	
Greek symbols	**Definition**	**Units**	**Comments**
$\dot{\gamma}(r,z)$	shear rate	1/s	
ε	specific power dissipation	W/m^3	
ε_r	dielectric constant		also known as relative permittivity and sometimes written as ε
μ	dynamic viscosity	Pa s	
ν	kinematic viscosity	m^2/s	
ρ	density	kg/m^3	
$\sigma^2(\dot{\gamma})$	variance in the shear rate	1/s^2	
$\sigma^2(\varepsilon)$	variance in the specific power dissipation	W^2/m^6	
Abbreviation	**Definition**		
COBR	continuous oscillatory baffled reactor		
CSTR	continuous stirred tank reactor		
DIBAL	diisobutylaluminum hydride		
HETP	height equivalent of a theoretical plate		
HEX	heat exchanger reactor		
RSR or RS-SDR	rotor-stator spinning disk reactor		
RTD	residence time distribution		
SC	supercritical		

SCF	supercritical fluid
SN1	nucleophilic substitution of type 1
SDR	spinning disk reactor
TF-SDR	thin-film spinning disk reactor
TS	transition state