

Nomenclature

C. I	Confidence Intervals
C_b	Concentration in the averaged fluid, [$mol/m^3 liquid$]
C_{cat}	Catalyst concentration, [g/L]
$C_{EB,L}$	Concentration of ethylbenzene in liquid phase, [$mol/m^3 liquid$]
$C_{EB,S}$	Concentration of ethylbenzene at the outer surface of catalyst particle, [$mol/m^3 liquid$]
C_i	Concentration at the interface, [$mol/m^3 liquid$]
$C_{H_2,i}$	Concentration of hydrogen in gas-liquid interphase, [$mol/m^3 liquid$]
$C_{H_2,L}$	Concentration of hydrogen in liquid phase, [$mol/m^3 liquid$]
$C_{H_2,S}$	Concentration of hydrogen at the outer surface of catalyst particle, [$mol/m^3 liquid$]
$C_{St,L}$	Concentration of styrene in liquid phase, [$mol/m^3 liquid$]
$C_{St,S}$	Concentration of styrene at the outer surface of catalyst particle, [$mol/m^3 liquid$]
D	Molecular diffusion coefficient, [m^2/s]
F_{H_2}	Molar flow rate, [mol/s]
F_{obj}	Objective function

H_E	Henry constant, [$Pa \cdot m^3/mol$]
k_i	observed mass transfer constant, [m/s]
k_L	Specific gas-liquid mass transfer coefficient related to liquid side film, [m/s]
k_S	Specific liquid-solid mass transfer coefficient, [m/s]
$K_{H_2}, K_{St},$ $K_{Eth}, K_I,$	Chemisorption equilibrium constants of hydrogen, styrene, ethylbenzene and intermediate [$m^3 liquid/mol$]
k'_{obs}	Observed rate constant for a competitive Langmuir-Hinshelwood reaction when styrene is in excess based on unit weight of catalyst particle (either pellet or fine particles), [$\sqrt{mole \cdot m^3 liquid/g cat \cdot s}$]
k'_1	Intrinsic chemical reaction rate constant based on unit weight of catalyst, [$mole/g cat \cdot s$]
MTR	Mass transfer rate, [$mol/m^3 liquid \cdot s$]
N	Stirrer speed, [rpm]
P	Pressure, [bar]
R	Gas constant, [$m^3 \cdot bar/K \cdot mol$]
r'	Reaction rate based on unit weight of catalyst, [$mol/g cat \cdot s$]
T	Temperature, [K]
t	Time, [s]

V_L	Volume of bulk liquid phase in the reactor, [m^3]
V_{LS}	Volume of liquid associated with the catalyst, [m^3]
W_C	Catalyst weight, [g]

Greek letters

α_g	interfacial area available for mass transfer, [$m^2/m^3 liquid$]
α_s	Liquid-solid mass transfer area of stirred tank reactor per unit weight of catalyst, [$m^2/g cat$]
ε	Effectiveness factor, [-]
θ	Fraction of active sites

Subscripts

EB	Ethylbenzene
Exp	Experimental
G	Gas
H_2	Hydrogen
i	Gas-liquid interface
L	Liquid phase
S	Solid phase
Sim	Simulated

St	Styrene
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