UNITS

Variables	Units
temperature	kelvin
activation energy	joules
volume	$1\ dm^3 = 1$ liter
concentration	moles/liter

Design Equations (gas phase)

CSTR	PFR
$V=(Fao*X)/-ra$	$dFa/dV=ra$
$Fao=Cao*vo$	$Fa=Fao(1-X)$
$V=(Cao\,voX)/-ra$	$dFa=d(-Fao(1-X))=-Fao*-dX=>Fao(dX/dV)=-ra-$
$Cao=Nao/v-=Pao/R\,To=(yaoPo)/R*To$	$dV=Fao(dX/-ra)=>0->V \int dV=V$
$V=(yaoPovoX)/(RTo*-ra)$	$0->X \int Fao(dX/-ra)=>V=Fao\ 0->X \int dX/-ra$
	PBR
	$Fao*(dX/dw)=-ra'$
	$W=Fao\ 0->X \int dX/-ra'$

Conversion

X=Xa=moles of A reacted/moles of A fed in=(Nao-Na)/Nao
$Na=Nao(1-X)$
$Fa=Fao(1-X)$
$Ca=Cao(1-X)$

Design Equations (liquid phase)

CSTR	PFR
$V=(Fjo-Fj)/-rj$	$rj=dFj/dV$
$V=(voCjo-vCj)/-rj$	$V=Fjo->Fj \int dFj/rj$
$V^{isom}=vo(Cao-Ca)/kCa$	$ra=dFa/dV$, $Fa=VCa$
$V=(FaOX)/-ra$	$ra=(d(vo*-Ca))/dV$
$V=(Cao\,voX)/(k*Ca)$	$V^{first\ order}=Cao\,vo\ 0->X \int 1/(kCao*(1-X))\ dX$
$V=(vo*X)/(k(1-X))$	

Activation Energy

$k=Ae^{-Ea/RT}$
$\ln k = \ln A\ (-Ea/RT)$
$Ea = (R\ln(k2/k1))/(1/T1-1/T2)$

Design Equations (liquid phase)

PBR	BR
$dFj/dw=rj'$	$dNa/dt=raV$
$w=Fjo->Fj \int dFj/rj'$	$Na(t)=Nao(1--X(t))$
$w=(Fjo-Fj)/-rj'$	$Nao(dX/dt)=-raV$
	$t=Nao*(0->X) \int dX/-raV$

Random Shit I need to Know

$PV=nRT => n/V=Cto=P/RT$	$-ra=k(Ca^2Cb-(Cc/Kc))$
$Cjo = yjo*Cto$	$kc=Cc/(Ca^2Cb)$
$Ca=(Cao(1-X)/(1+\varepsilon X)$	$-ra=0$ @ equilibrium
$Cb=(Cao(\theta b-(b/a)X))/(1+\varepsilon X)$	
$Cc=(Cao(\theta c+(c/a)X))/(1+\varepsilon X)$	
$Ci=Cio/(1+\varepsilon X)$	

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