IDEAL REACTORS

BAtch reactor:

* Uniform composition
* Varies with time
* Constant volume
* Simple
* Little supporting equipment
* Ideal for small-scael experimental studes on rxn kinetics
* t = integral(dC/r)

Mixed Flow Reactor:

* Uniform composition in position
* Composition does not vary with time
* Outlet concentration = reactor concentration
* Constant volume
* Taum = CA,0-CA/-rCa = V/v = V/(FA/CA0)
* Graphically: tau = Area between CA and CA0 under original rA value

Plug Flow Reactor:

* Composition varies with axial position
* Composition doe snot vary with time
* Constant volume
* No axial mixing
* Homogeneous radial composition
* Taup = integral(dC/r)
* Graphically: area under rate curve between CA and CA0
* More efficient than MFR

Designing a reactor:

* Apply mass balance: In = Out + Rxn + Accumulation

Enzymatic Reaction Kinetics: nth order

* -r = kCn
* From performance equation, use MM kinetics
* -r = VmCA/(Km + CA)
* Plug into performance equation
* For PFR: tau = Km/Vm \* ln(1/1-X) + C0X/Vm

Multiple Reactor Systems:

* Output concentration of one is inlet concentration of next
* Total spacetime = sum of all taus = sum volumes / q
* For PFR of 3 in series: integral (C0 to C3 dC/r) = -C0 \* integral(0 to X dX/r)
* For MFR: Tau = Ci-1 - Ci / -r
* For mix of both: MFR or PFR first?
* For mix in parallel: mass balance at mixing point before outlet concentration: Cmqm + Cpqp = Coutqtotal

NON-IDEAL FLOW

* E(t): integral (Edt) = 1, exit age distribution
* F(t) = integral (0 to t Edt) percentage leaving reactor at time t
* E = dF/dt
* Measuring E and F
* Pulse and step input experiments
  + Pulse: everything instantaneously, particles dispersed exiting reactor (E curve)
  + Step: increase concentration and leave constant, output looks like S curve (F curve)
* If E known, can determine F.
  + Determine peaks on E: steep slopes on F
  + Determine valleys on E: (relatively) flat areas on F
* Longer residence time, higher conversion