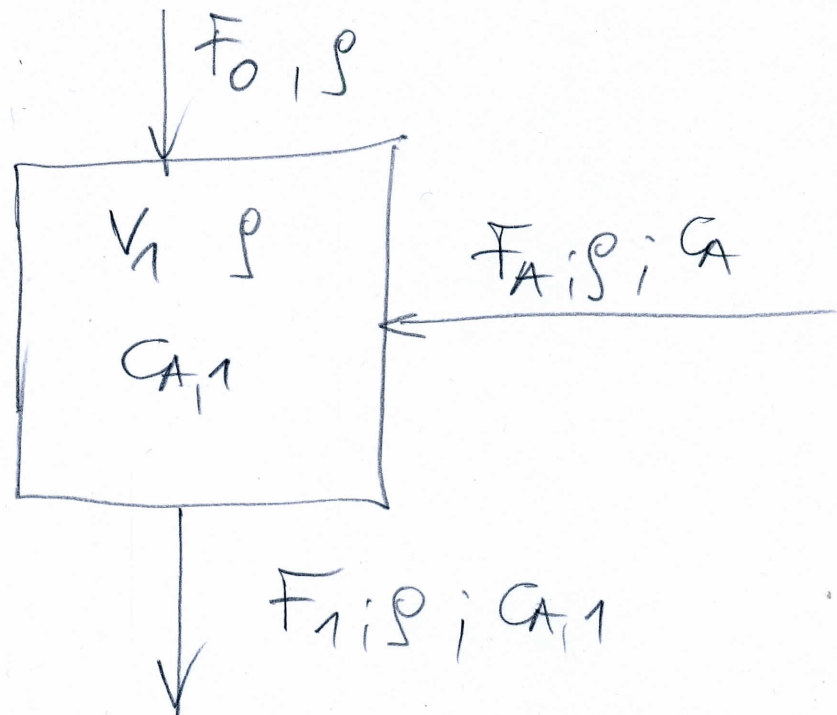


Balance region 1



Total mass

$$\frac{d(V_1 \rho)}{dt} = (F_0 + F_A - F_1) \rho$$

if:  $d\rho = 0$ ;  $dV_1 = 0$

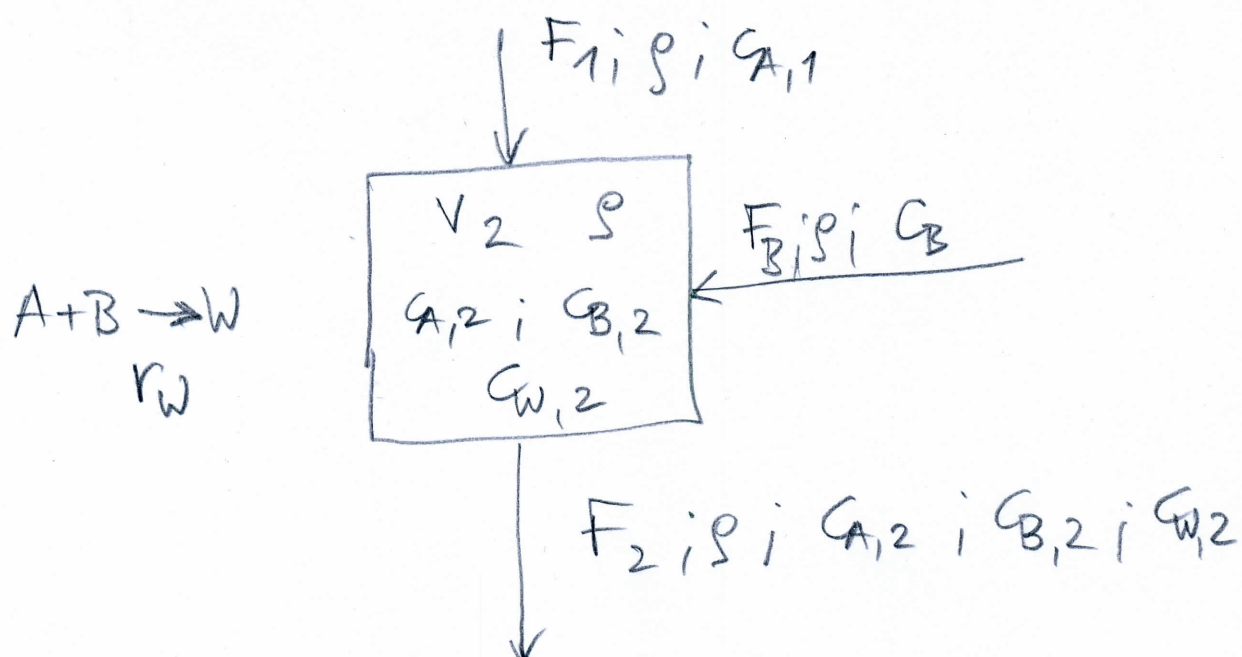
$$F_1 = F_0 + F_A$$

Balance component A

$$V_1 \frac{dC_{A,1}}{dt} = F_A C_A - F_1 C_{A,1}$$

no reaction in region 1

Balance region 2



Total mass balance with  $dV_2=0$ ;  $dp=0$

$$F_2 = F_1 + F_B$$

Balance component A

$$V_2 \frac{dC_{A,2}}{dt} = F_1 C_{A,1} - F_2 C_{A,2} - r_W \cdot V_2$$

Balance component B

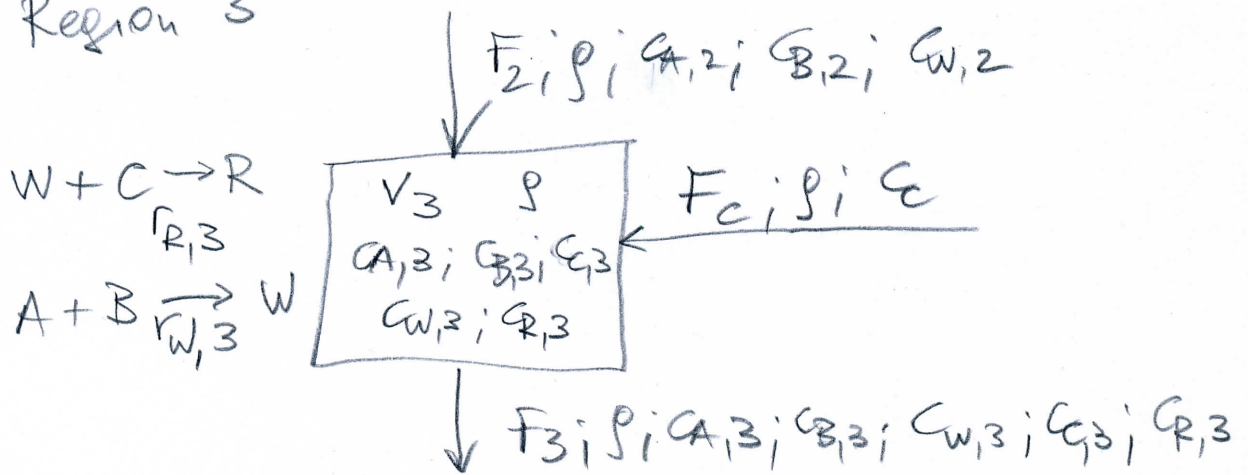
$$V_2 \frac{dC_{B,2}}{dt} = F_B \cdot C_B - F_2 C_{B,2} - r_W \cdot V_2$$

Balance component W

$$V_2 \frac{dC_{W,2}}{dt} = -F_2 C_{W,2} + r_W \cdot V_2$$

9.1.4

Region 3

Total mass balance at  $dV_3=0, dp=0$ 

$$F_3 = F_2 + F_c$$

Balance A

$$V_3 \frac{dC_{A,3}}{dt} = F_2 C_{A,2} - F_3 C_{A,3} - r_{W,3} \cdot V_3$$

Balance B

$$V_3 \frac{dC_{B,3}}{dt} = F_2 C_{B,2} - F_3 C_{B,3} - r_{W,3} \cdot V_3$$

Balance C

$$V_3 \frac{dC_{C,3}}{dt} = F_c C_c - F_3 C_{C,3} - r_{R,3} \cdot V_3$$

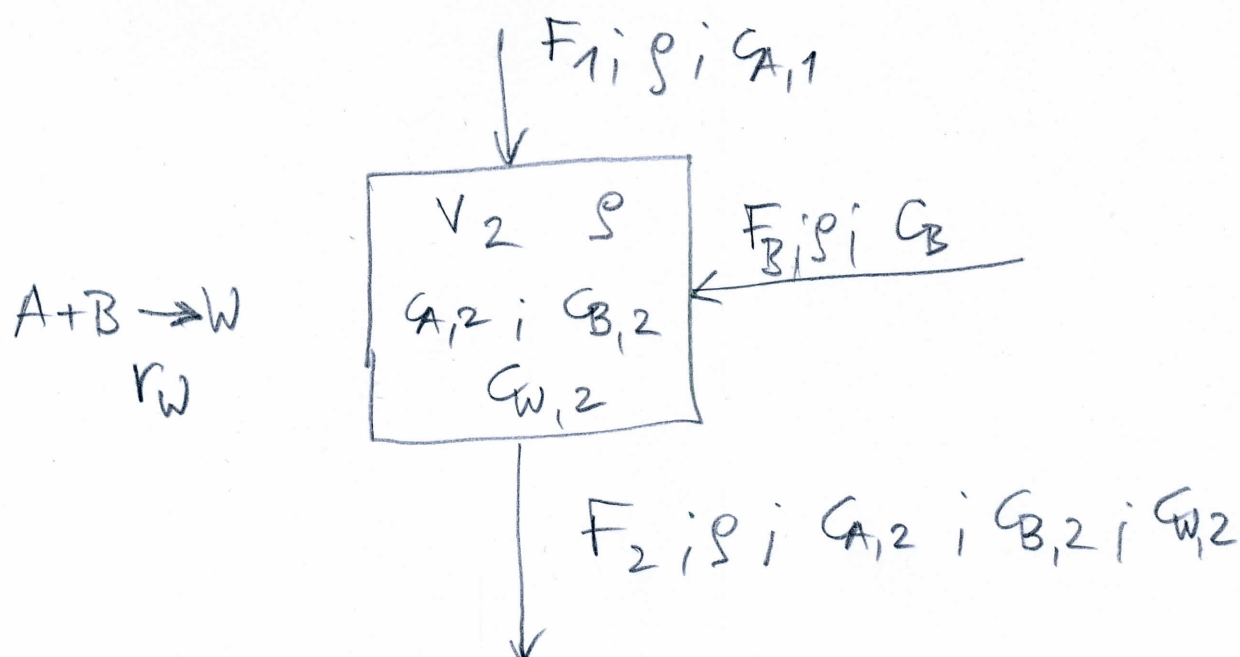
Balance W

$$V_3 \frac{dC_{W,3}}{dt} = F_2 C_{W,2} - F_3 C_{W,3} + r_{W,3} \cdot V_3 - r_{R,3} \cdot V_3$$

Balance R

$$V_3 \frac{dC_{R,3}}{dt} = -F_3 C_{R,3} + r_{R,3} \cdot V_3$$

Balance region 2



Total mass balance with  $dV_2 = 0$ ;  $dp = 0$

$$F_2 = F_1 + F_B$$

Balance component A

$$V_2 \frac{dC_{A,2}}{dt} = F_1 C_{A,1} - F_2 C_{A,2} - r_w \cdot V_2$$

Balance component B

$$V_2 \frac{dC_{B,2}}{dt} = F_B \cdot C_B - F_2 C_{B,2} - r_w \cdot V_2$$

Balance component W

$$V_2 \frac{dC_{W,2}}{dt} = -F_2 C_{W,2} + r_w \cdot V_2$$

Initial values:

$$C_{A,1} = C_{A,2} = C_{A,3} = 0$$

$$C_{B,2} = C_{B,3} = 0$$

$$C_{W,2} = C_{W,3} = 0$$

$$C_{R,3} = 0$$

Reaction rates, 1<sup>st</sup> order assumption

$$r_W = k_W \cdot C_{A,i} C_{B,i}$$

$$r_R = k_R \cdot C_{W,i} C_{B,i}$$

Parameters

$$F_0, F_A, F_B, F_C$$

$$V_1, V_2, V_3$$

$$k_W, k_R$$

Uncertainties:

$$F_1 = f(V_1)$$

$$F_2 = f(V_2)$$

$$F_3 = f(V_3)$$