ERQ II – P1 Modelo 1

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Conteúdo

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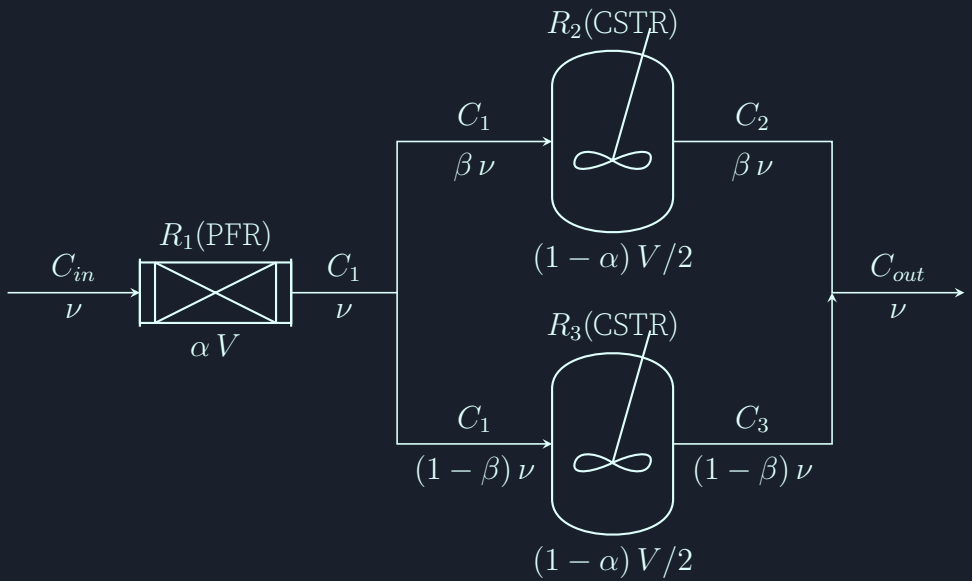
1 Modelo


R_2(CSTR)
C_1
$\beta\,\nu$
C_2
$\beta\,\nu$
R_1(PFR)
C_{in}
ν
C_1
ν
$(1-\alpha)\,V/2$
C_{out}
ν
R_3(CSTR)
C_1
$(1-\beta)\,\nu$
C_3
$(1-\beta)\,\nu$
$\alpha\,V$
$(1-\alpha)\,V/2$

2.1 C2

$$\boldsymbol{C_{2,i+1} = C_{2,i} + \frac{C_{1,i} - C_{2,i}}{\tau/2} \frac{\beta}{1-\alpha} \Delta t}$$

$$\nu\,\beta\,C_1 = \nu\,\beta\,C_2 + (1-\alpha)\,(V/2)\,\frac{\mathrm{d}C_2}{\mathrm{d}t} \implies$$

$$\implies \beta\,C_1 = \beta\,C_2 + (1-\alpha)\,(\tau/2)\,\frac{\mathrm{d}C_2}{\mathrm{d}t} \implies$$

$$\implies \frac{\mathrm{d}C_2}{\mathrm{d}t} = \frac{C_1 - C_2}{\tau/2}\,\frac{\beta}{1-\alpha} \implies$$

$$\implies \frac{\Delta C_2}{\Delta t} = \frac{C_{2,i+1} - C_{2,i}}{\Delta t} = \frac{C_{1,i} - C_{2,i}}{(1-\alpha)\,\tau/2}\,\beta \implies$$

$$\implies C_{2,i+1} = C_{2,i} + \frac{C_{1,i} - C_{2,i}}{\tau/2}\,\frac{\beta}{1-\alpha}\,\Delta t$$

2.2 C3

$$\boldsymbol{C_{3,i+1} = C_{3,i} + \frac{C_{1,i} - C_{3,i}}{\tau/2} \frac{1-\beta}{1-\alpha} \Delta t}$$

$$(1-\beta)\,\nu\,C_1 = (1-\beta)\,\nu\,C_3 + (1-\alpha)\,(V/2)\,\frac{\mathrm{d}C_3}{\mathrm{d}t} \implies$$

$$\implies (1-\beta)\,C_1 = (1-\beta)\,C_3 + (1-\alpha)\,(\tau/2)\,\frac{\mathrm{d}C_3}{\mathrm{d}t} \implies$$

$$\implies \frac{\mathrm{d}C_3}{\mathrm{d}t} = \frac{C_1 - C_3}{\tau/2}\,\frac{1-\beta}{1-\alpha} \implies$$

$$\implies \frac{\Delta C_3}{\Delta t} = \frac{C_{3,i+1} - C_{3,i}}{\Delta t} = \frac{C_{1,i} - C_{3,i}}{\tau/2}\,\frac{1-\beta}{1-\alpha} \implies$$

$$\implies C_{3,i+1} = C_{3,i} + \frac{C_{1,i} - C_{3,i}}{\tau/2}\,\frac{1-\beta}{1-\alpha}\,\Delta t$$

2.3 C out

$$\boldsymbol{C_{out} = \beta\, C_2 + (1 - \beta)\, C_3}$$

$$\nu\, C_{out} = \beta\, \nu\, C_2 + (1 - \beta)\, \nu\, C_3 \implies$$
$$\implies C_{out} = \beta\, C_2 + (1 - \beta)\, C_3$$