

Exercise 20

1. Estimate the Bodenstein number in a fixed-bed reactor of length $L = 0.1 \text{ m}$ and internal diameter $d_t = 5 \text{ mm}$ filled with spherical particles of diameter $d_p = 0.3 \text{ mm}$ at a space-time of liquid reaction mixture of $\tau = 60 \text{ s}$. The bed void fraction is $\varepsilon = 0.4$. Transport properties: $D_m = 10^{-9} \text{ m}^2 \text{s}^{-1}$, $\nu = 10^{-6} \text{ m}^2 \text{s}^{-1}$. Can the residence time distribution in the reactor be qualified as plug-flow?
2. What would be the Bodenstein number if the reactor had not been filled with particles?