

Exercise 6

A fast, homogeneous reaction was carried out in a single, straight cylindrical microchannel. A catalytic side-reaction also took place at the channel wall, which was responsible for a selectivity loss of ~2%.

- Channel diameter = 0.1 mm
- Channel length = 1 cm
- Residence time = 0.01 s

In order to better control the heat of reaction, it is proposed to use a parallel multichannel reactor with a channel diameter of 0.05 mm, keeping the same process efficiency (i.e., conversion of the desired reaction) and the same pressure drop.

Questions

- Calculate the new reactor dimensions (N_c, L_c) and the required residence time
- What are the implications of the new design on the mass and heat transfer rates? If any, calculate their relative changes compared to the mono-channel reactor
- Estimate the impact of the new reactor design on the reaction selectivity