

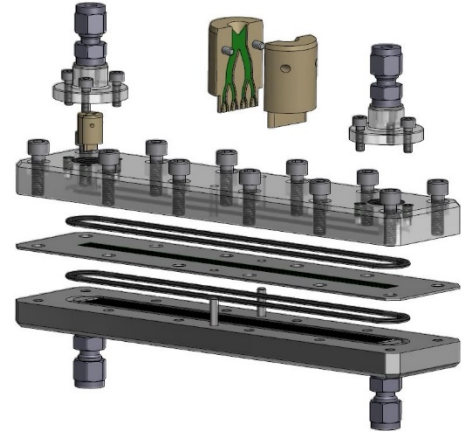
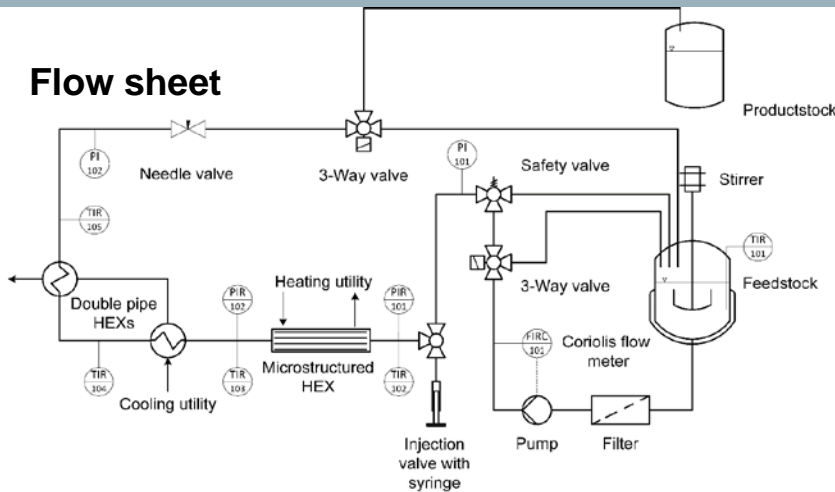
Micro structure fouling test rig

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Motivation

- Microprocess engineering offers interesting opportunities for high heat transfer rates and short residence times
- General of lack of early fouling detection methods as well as fouling mitigation strategies suitable for microcomponents [1]
- Microcomponents are vulnerable to fouling or blockage, especially while processing ingredients for food and feed applications [2]

Flow sheet

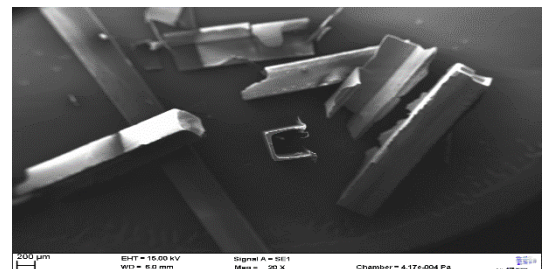


Experimental capabilities

- Monitoring of integral process parameters such as:
 - Inlet and outlet temperatures
 - Thermal fouling resistance
 - Pressure drop
- Direct optical observation of the fluid flow inside the microchannels
- Different possible channel geometries:
 - Rectangular microchannels ($a = 500 \mu\text{m}$)
 - Semicircular microchannels ($d = 500 \mu\text{m}$)
 - Semicircular microchannels ($d = 750 \mu\text{m}$)



Microstructured heat exchanger used for fouling experiments - view of the microchannels



WPI fouling layer removed from the microchannel after experiments

Process parameter	Unit	Range
Product mass flow	g/min	3 - 250
Heating utility mass flow	g/min	150 - 1500
Product temperature	°C	20 - 120
Heating utility temperature	°C	20 - 150
Pressure drop	bar	0.05 - 10
pH-Value	/	1 - 13
Number of microchannels	/	1, 2, 4 or 8

Literature

- [1] Schoenitz, M., Grundemann, L., Augustin, W. and Scholl, S.: Chem. Commun., 2015, 51, 8213-8228.
[2] Spiegel, C., Kraut, M., Rabsch, G., Küsters, C., Augustin, W. and Scholl, S.: Chem. Eng. Technol., 2019, 42: 2067-2075.