

# μFBR/CR - Test rig for continuous flow processes

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## Introduction

- Highly modular test rig for the investigation of reaction kinetics and synthesis in continuous flow of homo- and heterogeneous syntheses
- Particular benefits of continuous flow processes
  - More secure due to low holdup, lower cost for pressurization as well as easy interchangeability of the fixed bed packing
  - Pressurized processing in small dimensions enables temperatures above the boiling point
  - Fixation of solids in a fixed bed reactor reduces downstream processing



## Model reaction (heterogeneous)

Continuous flow di-*N*-alkylation of 1*H*-benzimidazole in a fixed bed reactor of  $K_2CO_3$

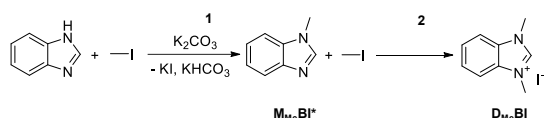
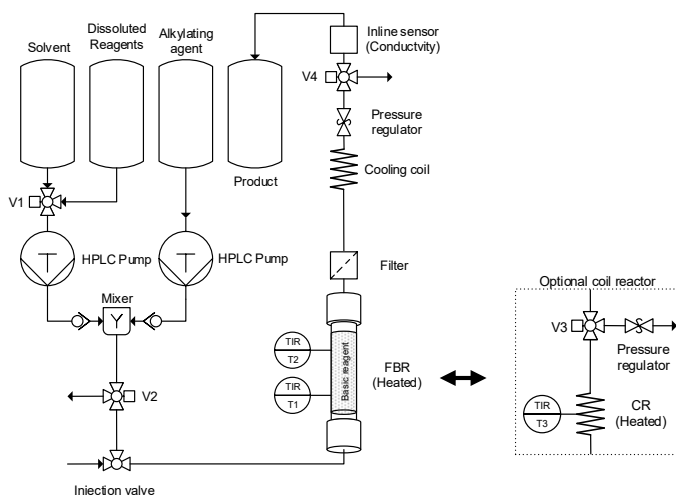


Figure 2: Reaction scheme of the 2-step synthesis of 1,3-dimethyl-1*H*-benzimidazol-3-ium iodide ( $D_{Me}BI$ ) in the presence of a solid base and methylene iodide in acetonitrile. \*1-methyl-1*H*-benzimidazol-3-ium iodide ( $M_{Me}BI$ )

## Process Flow Diagram



## Key components

- Three storage vessels for solvents and reagents
- Two HPLC pumps (Knauer P4.1S)
- Electrically heated fixed bed reactor (L = 250 mm; ID = 8 mm; stainless steel)
- Optional coil reactor (L = 5 m; ID = 1 mm; stainless steel)
- Mixer and valves for control of flow direction and mixing
- Inline conductivity sensor for process monitoring

Table 1: System dimension

	Fixed bed reactor	Coil reactor
<i>d</i>	8 mm	1 mm
<i>L</i>	0.25 m	~5 m
<i>V</i>	12.56 mL (empty)	3.94 mL
<i>V</i>	200 – 1000 μL/min	
<i>RT</i> *	~9 – 45 min**	~4 – 20 min
<i>T</i>	RT – 150 °C	