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Technology Offer

Optimised Flow-Through-Cell for Online-Microscopy

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For the evaluation of crystallisation processes, process parameters like temperature and concentration can be easily measured. However, to measure the crystal size distribution continuously is a challenging task.
Different methods relaying on back scattering or reflection of monochromatic light can be applied that yield chord-length distributions, which often deviate from the actual crystal or particle size distribution. For analysing the true crystal dimensions and, additionally, the crystal shape, though, imaging methods have to be used. For this purpose online microscopy being connected to the process by a bypass has been proven advantageous. The central element in online microscopy is the flow-through-cell, through which the suspension flows and is analysed. For the latter, the crystals are illuminated by a light source and monitored by a camera through corresponding windows. Subsequently, the crystal size distribution can be extracted from the pictures.
Commercially available flow-through-cell have certain disadvantages: Made from stainless steel the cells act as heat exchangers with the environment leading to fouling or blockades of the suspension flow. Adversely implemented guidance of the suspension flow, like bending by 90○ or channel widenings, reduce the flow velocity and increase the probability of sedimentation. Thus, the maximum measurable crystal size has to be much lower than the maximum size determined by the given construction..

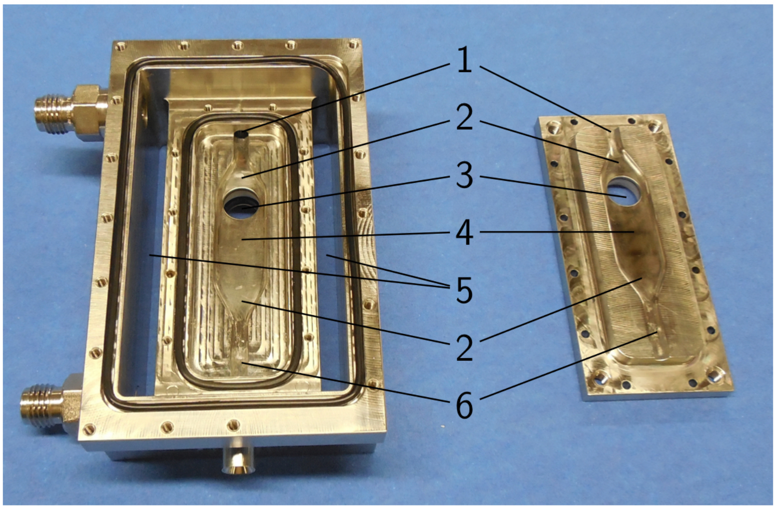

Figure 1: Disassembled flow-through-cell with basis (left) and lid of the flow channel (right); 1: inlet, 2: diffusor portion, 3: window, 4: measuring portion, 5: channel for tempering fluid, 6 outlet.

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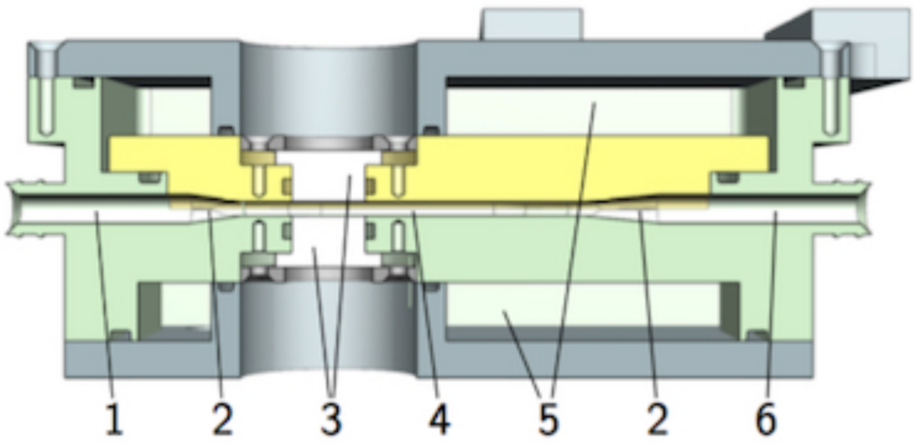

Figure 2: Schematic view on the flow-through-cell illustrating the basis (green) and lid of the flow channel (yellow) as well as the top and bottom lid for the tempering channel (grey); 1: inlet, 2: diffusor portion, 3: windows, 4: measuring portion, 5: channel for tempering fluid, 6 outlet.

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The invention covers an improved flow-through-cell for online microscopy. The flow channel was optimised regarding the flow regime and velocities to prevent sedimentation. On the one hand, the inlet and outlet have a round shape facilitating implementation in commonly utilized plant setups and tubings. The measuring portion of the flow channel, on the other hand, is constructed as an oblong hole (s. Fig. 1). This shape – broadened and less in height – ensures the monitoring of individual crystals when passing the windows. To suppress wake space, turbulences and sedimentation, diffusor portions connect the measuring portion with the inlet and outlet, respectively. In the diffusor portion the height and width of the flow are adjusted gradually (s. Fig. 2).

Furthermore, the temperature of the cell can be controlled to prevent crystallisation at the inner surfaces and dissolution, which alters the measurement result. For this purpose, the flow channel is surrounded by a tempered fluid that is pumped from an external heat exchanger. The large surface – more or less the whole channel is covert – allows a precise control of the temperature of the suspension.

Summary

- optimised flow in the cell prevents sedimentation
- controlled temperature prevents crystallisation and dissolution
- direct integration to processes via bypass

Patent Information

DE patent applications filed in March 2018.

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