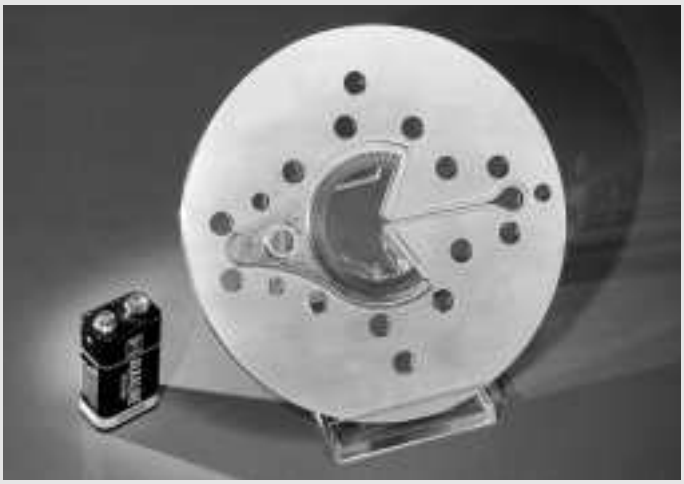
SUPERFOCUS INTERDIGITAL MICRO MIXER

SFIMM-V2

SuperFocus microstructured mixer SFIMM-V2



Central plate of the SFIMM-V2

Principle

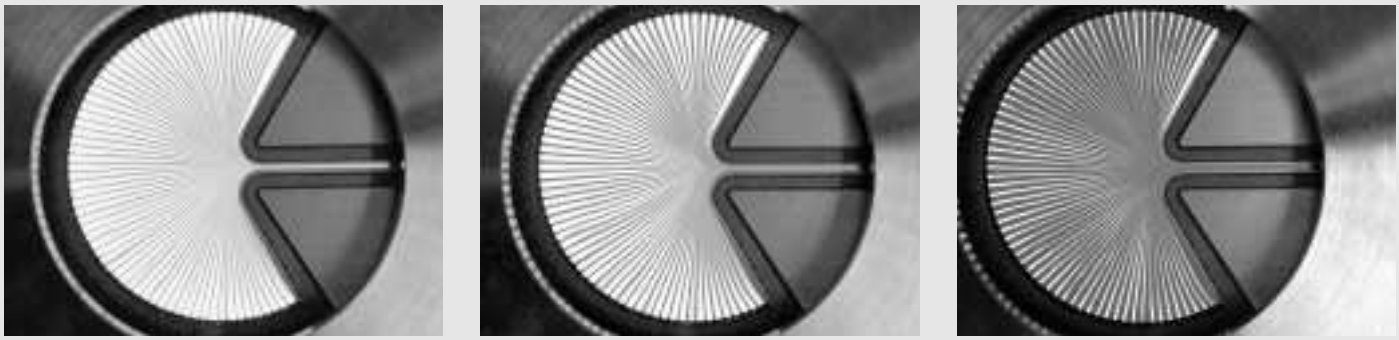
Focusing mixers perform a multi-laminating step and geometrically focus the streams (in a way similar to hydrodynamic focusing) to thin the lamellae and then mix by diffusion. Physically speaking, this means having a nozzle feed array, a triangular-type focusing chamber and a thin mixing channel. The novel SuperFocus Mixer Version 2 (SFIMM-V2) bases upon the simulation, design and characterisation of the former version SFIMM. Development target was to achieve even higher throughputs, to have a robust steel design, e.g. for high-pressure operation and to use a still higher focusing ratio, e.g. to reduce the sensitivity towards blockage. The novel SuperFocus mixer thus combines both high throughput, which is e.g. characteristic of the StarLam series and uniform flow patterns, which is e.g. characteristic for the SIMM components.

Compared to the predecessor design more nozzles enable fluid feed. The nozzle width was enlarged, thus being less particle sensitive, albeit the final focused lamellae width of about 4 µm was kept, i.e. the focusing ratio was increased from 40 formerly to now 178 (and can be set higher on demand). To arrange as many as 138 nozzles, a large circular arc was chosen for the feed array. The mixing channel width and length compares to the former design so that the semi-analytical and experimental reaction type based findings on the mixing time can be largely transferred to the new design. Although steel is employed as construction material, an optional inspection window may allow the monitoring of the flow patterns and of the mixing course.

For the new SuperFocus SFIMM-V2 throughput of about 350 l/h at a pressure loss of 3.5 bar was determined for watery systems. The formation of flow patterns is very uniform, i.e. a multi-lamellae flow is found all over the focusing chamber until the mixing channel is reached. The known deviations from ideal given for any multi-lamellae flow are found as well, e.g. that lamellae are thicker at the wall (boundary) than in the interior of the flow. In particular this deviation should be less here compared to other systems, as the ratio of outer to inner lamellae is 136:2.

Disassembled SFIMM-V2

The mixing time achievable is 4 ms according to calculation and experiments made with the former design, albeit excluding the time needed for flowing through the focusing chamber. The latter is dependent on the volume flow. Specialty designs with notably reduced focusing time are possible. The same holds for integrated mixing-heating element configurations, allowing one to perform fast temperature switches for starting and ending reactions in a very short, defined time frame, as e.g. done in quench-flow analysis.



Multi-lamellae flow in the SuperFocus microstructured mixer SFIMM-V2

Technical Data

Name	SuperFocus Interdigital Micro Mixer Version 2
Order number	SFIMM-V2
Mixing principles	Multi-lamination
Size (L x B x H)	140 x 140 x 40
Connectors (Inlet/Outlet)	1/4″ / 1/4″
Standard mixing channels (µm)	500 µm x 5 mm
Number of feeding channels	138
Width of feeding channel	260
Focusing ratio	178
Standard material	1.4435
Options	Other materials like Hastelloy, Monell or Titan on request; heat exchanger function is possible

Operating Conditions

Temperature (°C)	-40 – 220
Pressure stability (bar)	100
Flowrate (l/h)	10 – 300
Max Viscosity (mPas)	10000
Leakage Class	< $L_{0.001}$