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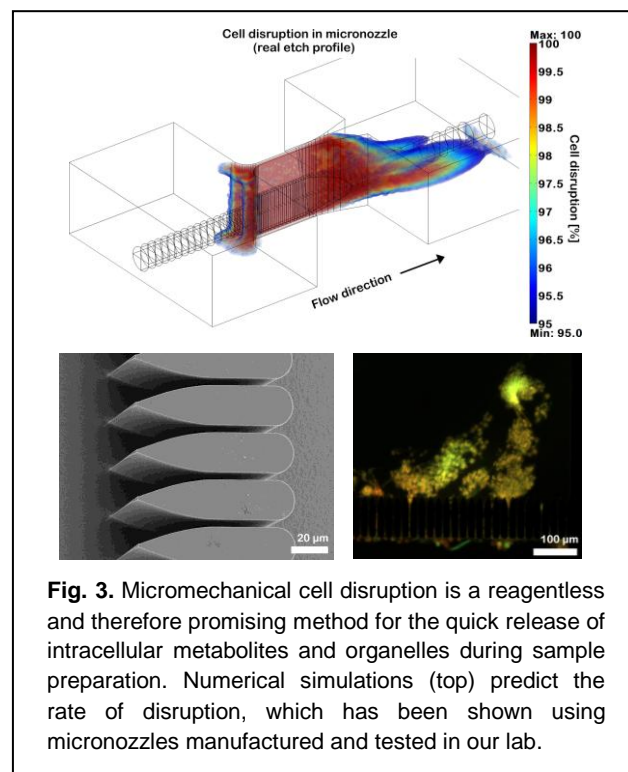
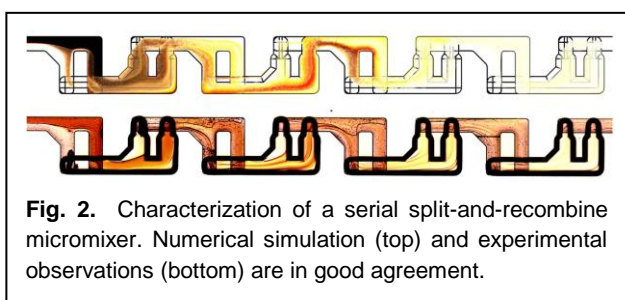
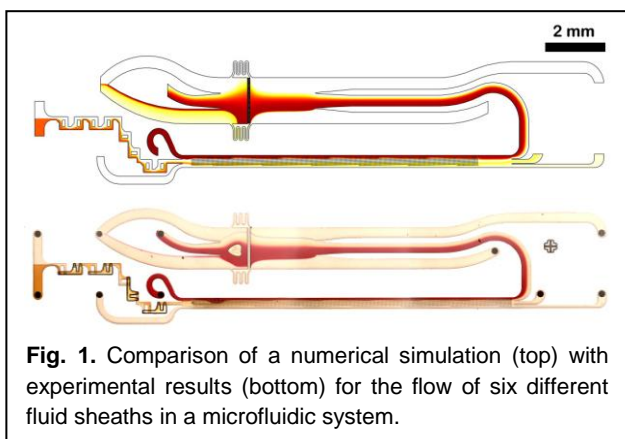
Project term: 2008 – 2012

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Description:

The integration of multiple unit operations into a microfluidic system requires a thorough conception prior to manufacturing and testing. Too many iterations of this process are costly both with respect to time and money consumption and should be reduced to a minimum. Since critical parameters of fluid behaviour, mixing rates and pressure drop cannot be determined analytically for complex, arbitrary geometries, numerical simulations are required to aid a rational design process. We are using finite-element based methods to: (1) characterize system layouts with respect to fluid dynamics and mixing of fluid streams, (2) predict undesired cell damage during sample processing, (3) evaluate mechanical cell disruption in microstructures as part of sample preparation for metabolic analysis and (4) characterize other microphenomena, e.g. particle deflection by magnetic or mechanical forces, species release from disrupted cells etc. Our goal is the implementation of computationally efficient models, which have been verified experimentally in our lab and which can be generally applied during the microfluidic systems design process.



References (selected)

- Erickson, D (2005). Towards numerical prototyping of labs-on-chip: modeling for integrated microfluidic devices. *Microfluidics and nanofluidics*, 1(4): 301-318.
- Wurm M, Schoepke B, Lutz D, Mueller J and Zeng AP (2010). Microtechnology meets systems biology: The small molecules of metabolome as next big targets. *Journal of Biotechnology*, 149(1-2):33–51.

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