

Hydrodynamic flow focusing for microfluidic cell sorting chip

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Introduction: Hydrodynamic flow focusing is an important requirement of microfluidic cell sorting devices. It allows the cells to arrive sequentially at the sorting location making detection easier.

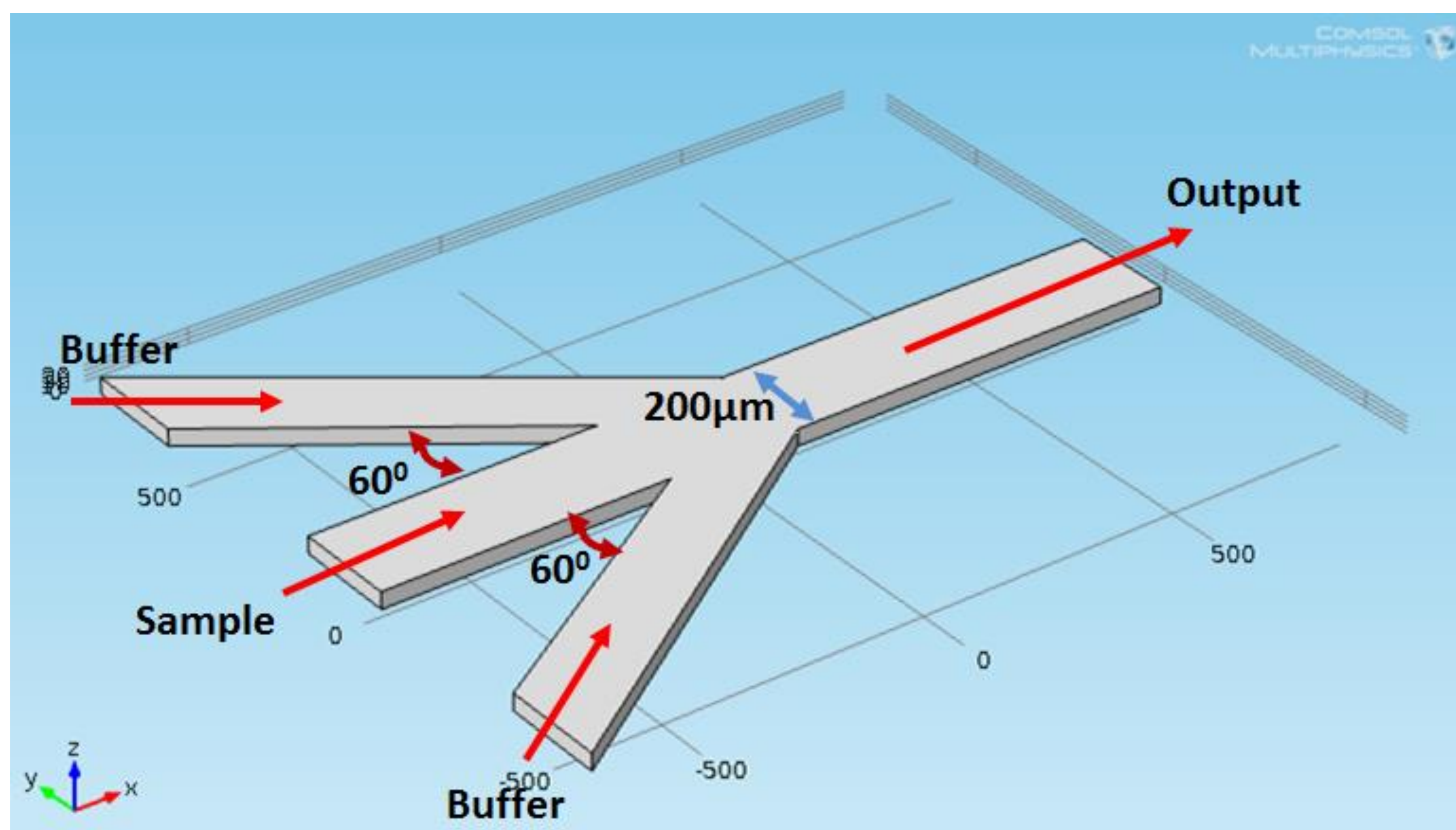


Figure 1. Flow focusing geometry. The figure shows the COMSOL model of the flow-focusing device.

Methodology:

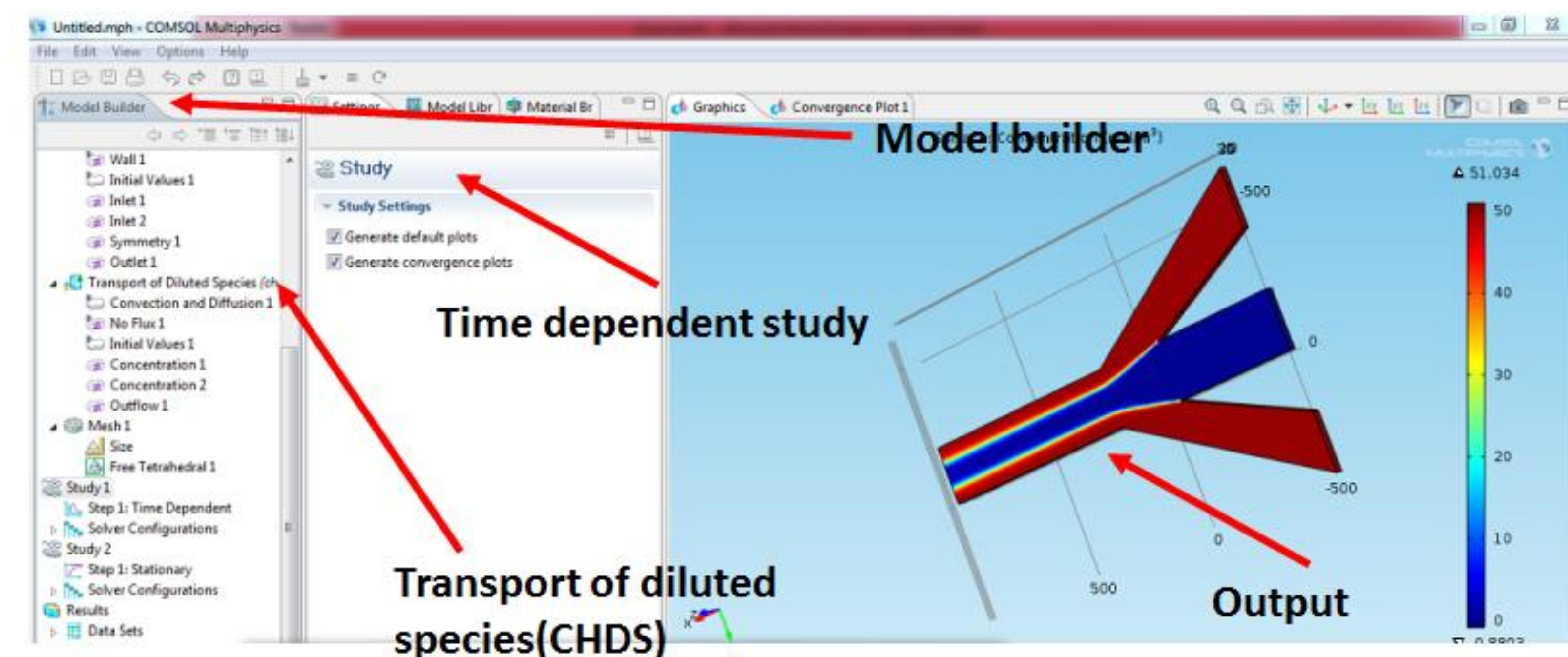


Figure 2. Screen-shot of the COMSOL environment after simulating the flow focusing device.

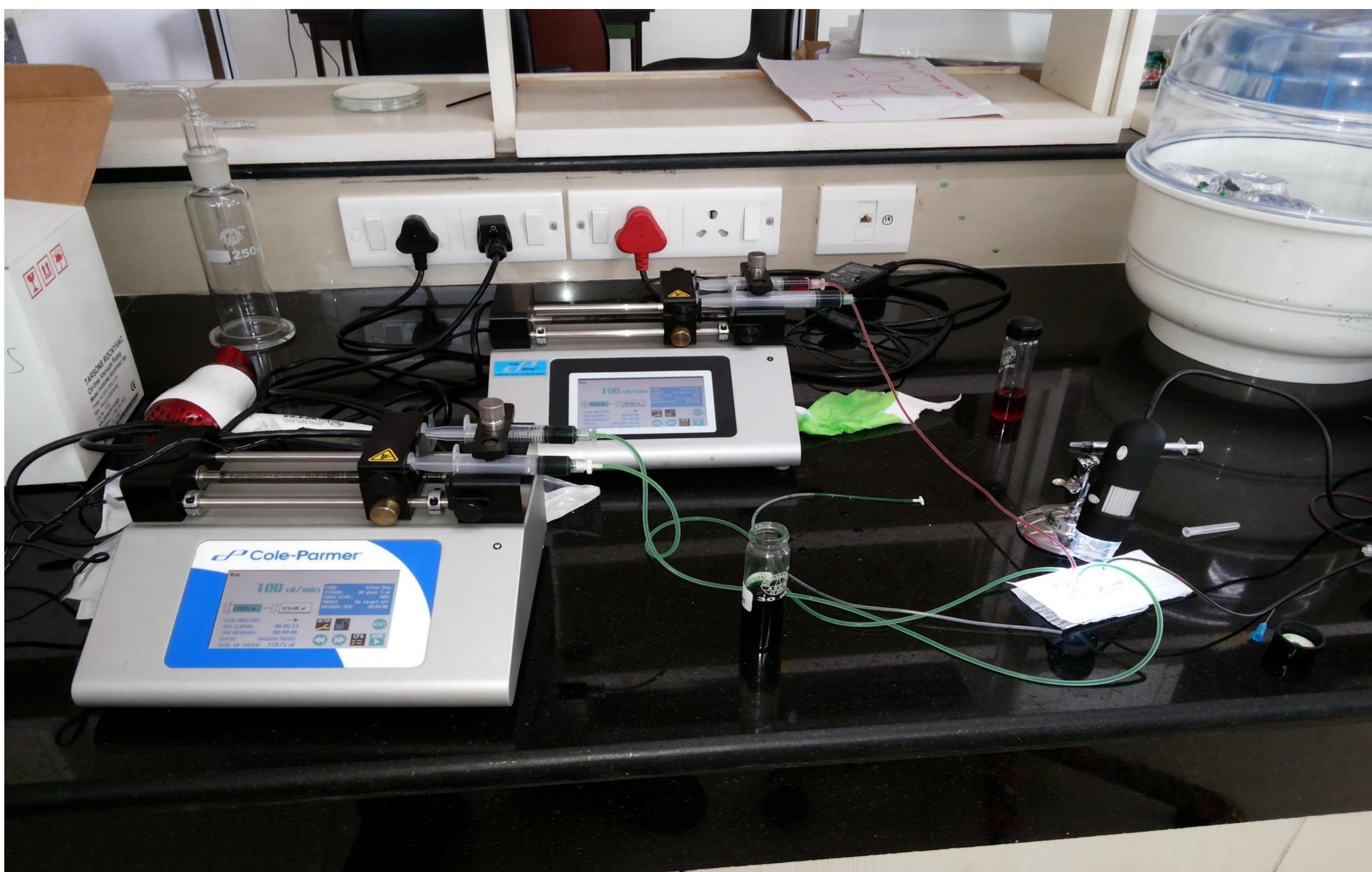


Figure 3. Experimental setup for hydrodynamic flow focusing.

Results:

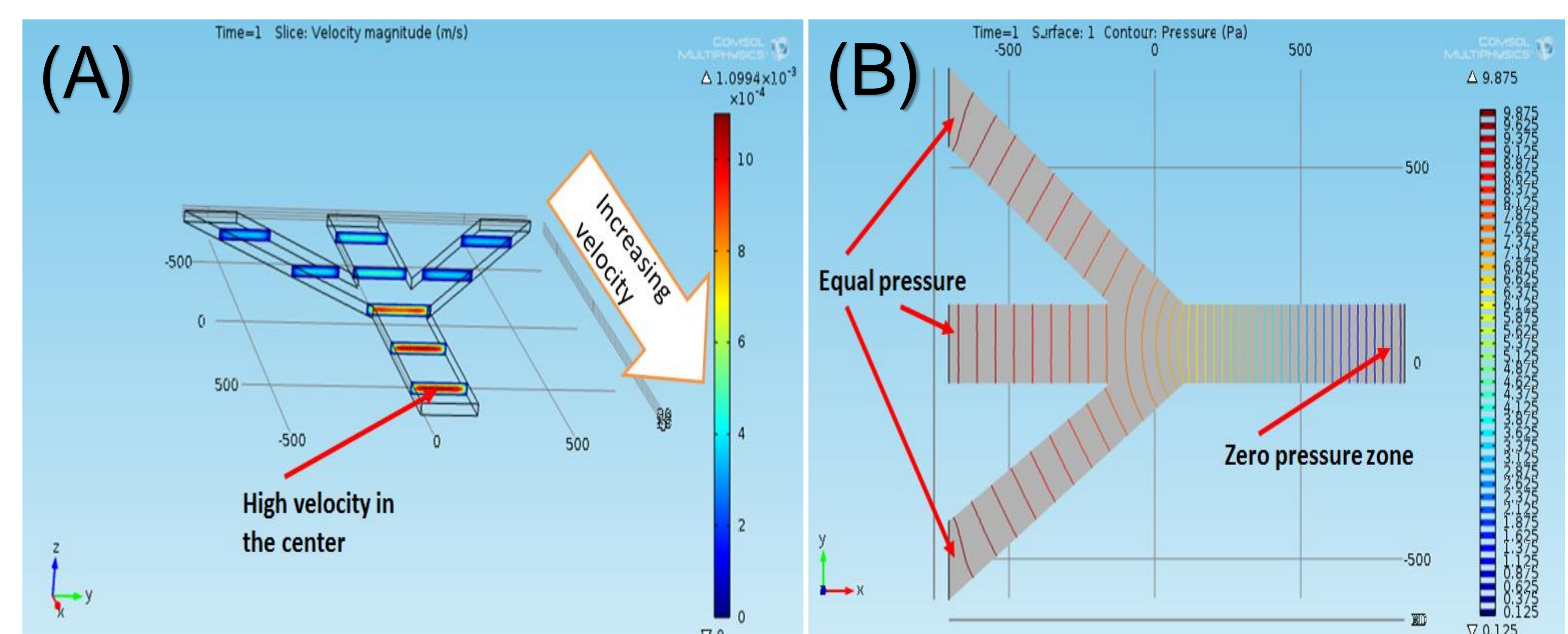


Figure 4. Velocity and pressure profile for flow-focusing device.

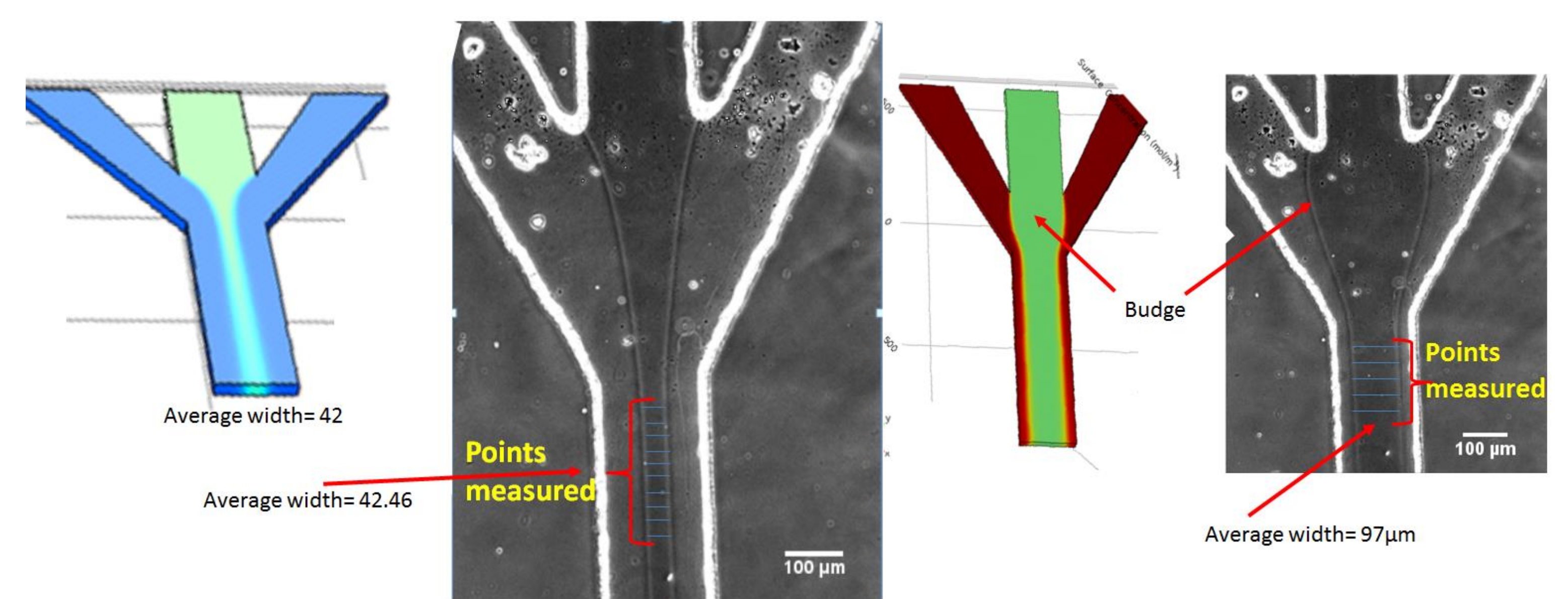


Figure 5. Comparison of COMSOL result with experiments under the same flow rates.

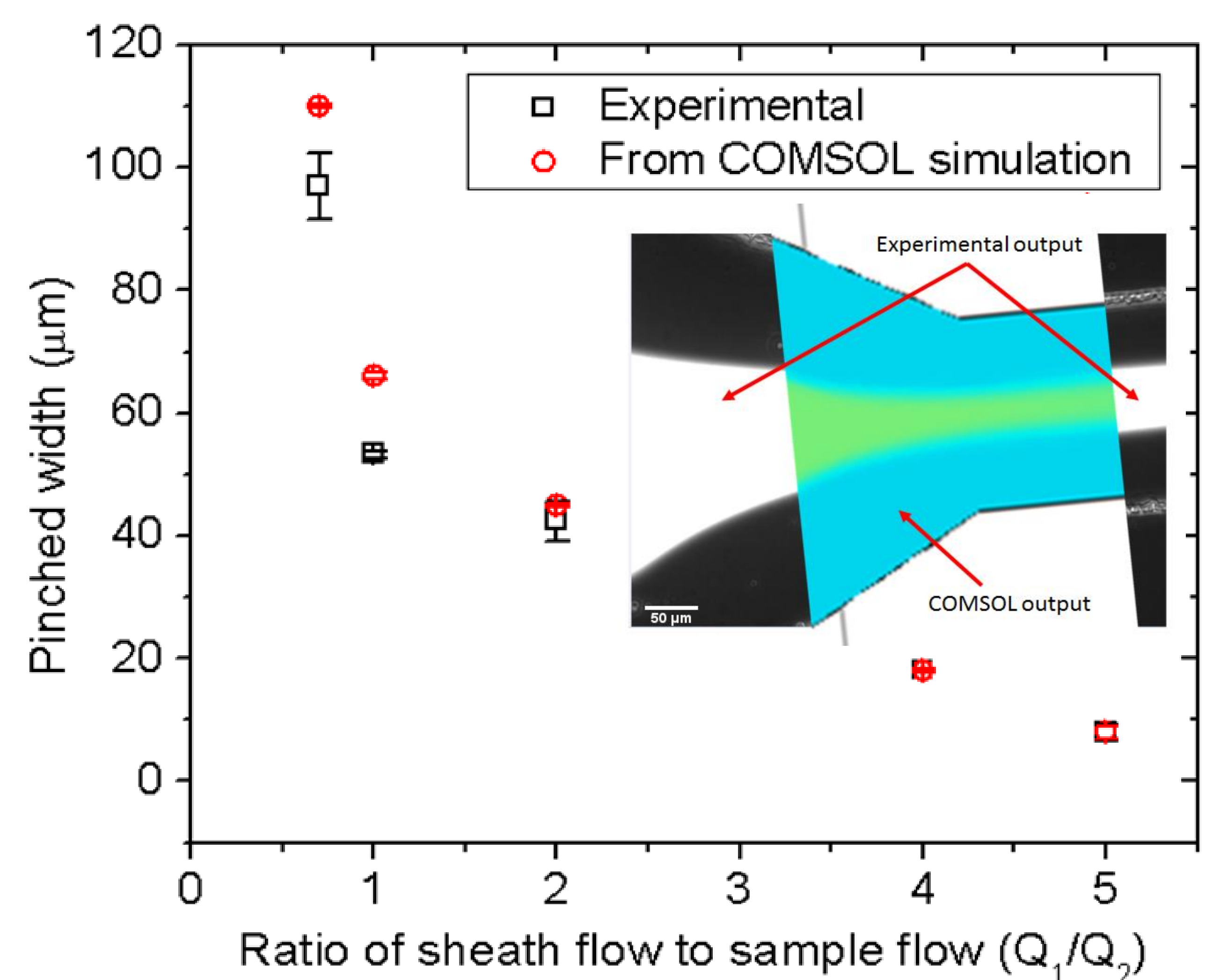


Figure 6. Focus width as a function of flow-rate ratio. Here y-axis depicts the focus-width in μm and x-axis depicts the ratio of sheath flow-rate Q_1 to sample flow-rate Q_2 .

Conclusions: Final focused width does not depend on the actual values of the flow rates, but depends on the ratio of sample flow (Q_2) to buffer flow (Q_1). The pinched width varies exponentially with the ratio of the two flow rates.