

Microfluidics Based Worm Sorter

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Abstract

The nematode *Caenorhabditis elegans* is a widely adopted model organism for studying various neurobiological processes at the molecular and cellular level in vivo. With a small, flexible, and continuously moving body, the manipulation of *C.elegans* becomes a challenging task.

A lab-on-a-chip (LOC), a device that integrates one or several laboratory functions on a single chip of only millimetres to a few square centimetres in size, is employed for screening of *C.elegans*.

Several methods are commonly used in the screening of *C.elegans*: manual picking, which is slow, tedious and labor intensive; chemical sterilization, which perturbs the animal's biology, and sorting using a FACS-based device, the COPAS Biosorter system, which is both complicated and expensive to use.

In particular, pressure driven Micro Fluid channels (Figure 1) are of our interest, which are used to sort out *C.elegans* based on GFP profiles by integrating two sets of emitting and detection fibers. This allows the device to screen *C.elegans* based on their optical properties without the help of a microscope, an image tracking algorithm and a computer.

To simulate the behavior of fluid in a channel COMSOL Multiphysics is used (Figure 2), which motivated us to develop a Y-shaped channel, and calculate the optimum numerical pressure variations such that velocity variations (Figure 3) in practice is feasible for sorting.

Reference

- 1.Xavier Casadevall i Solvas et al.
High-throughput age synchronisation of *Caenorhabditis elegans*
Chem. Commun., 2011,47, 9801–9803
- 2.Kwanghun Chung et al.
Automated on-chip rapid microscopy, phenotyping and sorting of *C. elegans*
NATURE METHODS VOL.5 NO.7,637-643,JULY 2008
- 3.Adela Ben-Yakare et al.
Microfluidics for the analysis of behavior, nerve regeneration, and neural cell biology in *C. elegans*
Current Opinion in Neurobiology 2009,19:561–567

Figures used in the abstract

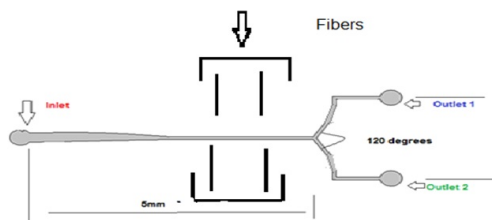


Figure 1: Y-Channel

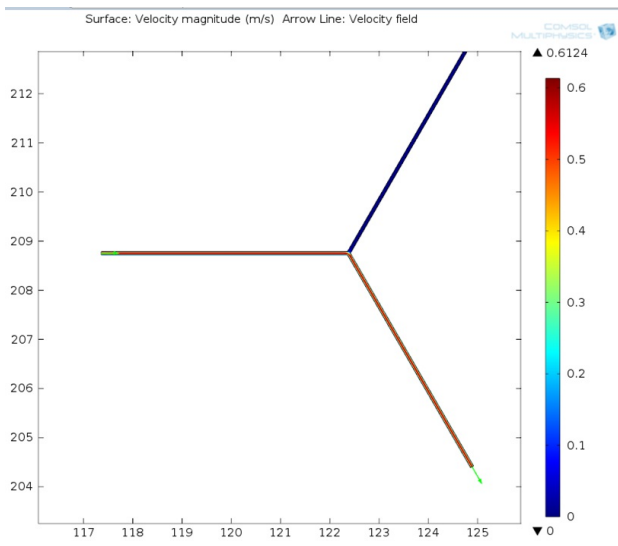


Figure 2: Velocity profile

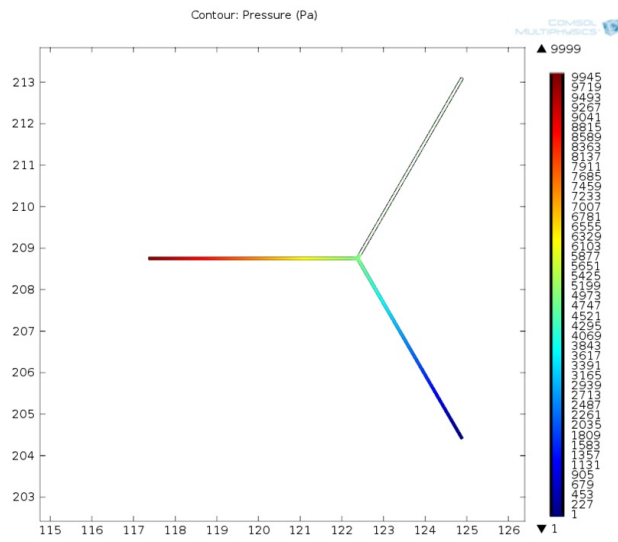


Figure 3: Pressure distribution