A Microfluidic Diode for Sorting *C. elegans*

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**Introduction**

- **Purpose of sorting C. elegans in different developmental stages**
  - C. elegans, a nematode, is a powerful model organism that develops from a single cell to a complex adult organism.
  - Sorting C. elegans can help study the effects of different developmental stages on behavior.

- **State of art sorting strategy of C. elegans by microfluidic platforms**
  - Microfluidic devices can be used for sorting C. elegans due to their ability to manipulate small volumes of fluid.

- **Our sorting strategy: Based on crawling behavior in different sized microfluidic diodes**
  - Microfluidic diodes can be designed to sort C. elegans based on their crawling behavior in different channels.

**Methods**

- **Fabrication of microfluidic devices**
  - The microfluidic diodes are fabricated using standard microfabrication techniques.

- **Source of unsynchronized C. elegans colony**
  - The unsynchronized C. elegans colony is used for experiments to study the effects of differences in size and behavior.

**Design and Result**

- **Different crawling performance of C. elegans in curved and straight channels**
  - Time-lapse photographs show the crawling behavior of C. elegans in curved and straight channels.

- **Microfluidic diode for C. elegan sorting**
  - A microfluidic diode is designed to sort C. elegans based on their crawling behavior.

**Conclusion**

- C. elegans (L4 and adult) have a spontaneous ability to compress themselves 20%-50% to penetrate the curved channels, but they cannot penetrate the straight channels with the same width under the same flow rate.

- After sorting process, the C. elegans from L4 and Adult (diameter: 31-72 μm) are divided in 7 sections based on their diameters. The diameter in average diameter of C. elegans in each section is about 5 μm.

- The average critical compressive ratio increases while the width of the channel decreases, which demonstrates that larva C. elegans can compress more than adult C. elegans in the unidirectional channels.

- Increasing flow rate might result in a significant enhancement of average critical compressive ratio in some specific channels.

**Future Work**

- Widen the region of sorting by fabricating channel arrays in smaller width.

- Design a collecting system for repeatable use of the device.

- Study the impact of curved channels’ shape and the length of the straight channels on the diode’s property.

- Introduce chemical stimuli to the C. elegans trapped in different sections of the original device and study their difference of response.

**Acknowledgements**

We thank for the financial support by the following funding, ARO: W911NF-15-1-0441; NEEC: N00174-16-C-0008 and D00: W911SR-14-2-0001, sponsored by the Edgewood Chemical and Biological Center (ECBC). Specially thank to Gfan Zhang and Lin Yang for comments and discussions, and the help from Yin Zhang in the experiment.

**References**