



Introduction

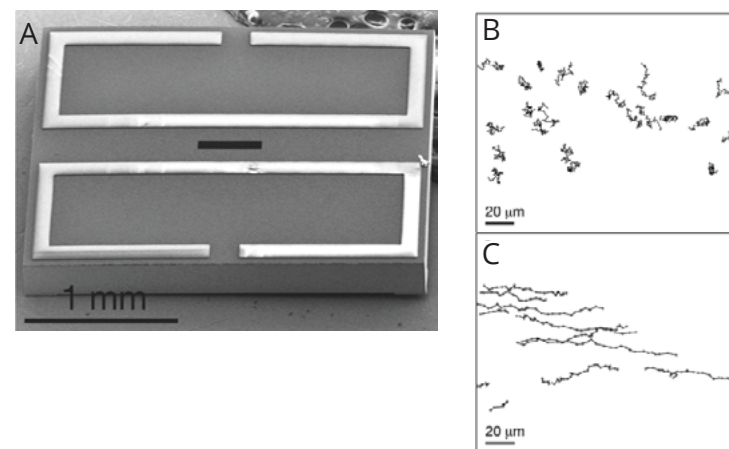
The E-chip family of sample supports provides a unique level of flexibility and control over the configuration of the microfluidic chamber within Poseidon. The liquid thickness and flow path within the microfluidic chamber can be adjusted using Poseidon GapSet technology which contains an integrated spacer layer in a range of heights. In this experiment, a solution of polystyrene microspheres was flowed through a chamber consisting of a standard, flat E-chip and a 6 μm thick GapSet E-chip. Trajectories of the polystyrene microspheres (0.282 μm) were then observed using fluorescence microscopy.

Experiment

The microfluidic chamber was assembled using a standard, flat E-chip and a 6 μm GapSet E-chip sandwiched together. A solution of 0.282 μm in diameter polystyrene microspheres diluted in water was introduced into the chamber using an initial pump speed of 5 $\mu\text{L}/\text{min}$, and microspheres were observed to reach the sample chamber within 4 minutes. Sequences of images were recorded using a TE300 wide-field fluorescence microscope with an exposure

time of 50 ms per image and an interval of 500 ms between images. Pump speeds of 2, 1, 0.5, and 0.1 $\mu\text{L}/\text{min}$ were applied and the particle flow rate was analyzed using the MTrackJ plugin for Image J. As a control, sequences of images were also recorded of 0.282 μm microspheres in static liquid (pump speed of 0 $\mu\text{L}/\text{min}$).

Discussion



An SEM image of the GapSet E-chip used to form the channel is shown in Figure A. Under static liquid conditions, the trajectories of the polystyrene microspheres

were primarily influenced by Brownian motion, as shown in Figure B. The microspheres assumed a linear trajectory after flow was applied, as shown in Figure C using a pump speed of 1 $\mu\text{L}/\text{min}$. Deviations from linearity decreased when larger (2.2 μm) microspheres were used due to the decreased effects of Brownian motion. The trajectories of the polystyrene microspheres were analyzed for five pump speeds. The flow rate of the microspheres responded linearly with the applied pump speed, with the rate of flow stabilizing within five minutes of adjusting the pump speed.

Applications

The GapSet E-chip channel design permits rapid exchange (~1 minute), of liquid within the sample chamber, allowing rapid injection of reagents or samples into the system. E-chips can be paired to provide a wide variety of window geometries, liquid volumes, heights, and flow paths. Contact us to discuss the full range of capabilities of Poseidon. We can be reached at (919) 377-0800 or contact@protochips.com.