Introduction

Micro-millimeter sized particles are commonly used products, such as ink drops in ink-jet printers and oil drops in car engines. The physical and qualitative stabilities of particles depend on their size and size distribution.

Aims and objectives

This project is designed to include droplet generating process, the droplet measuring and analyzing process and finally in hope of building a system which contains a closed-loop feedback the measuring information back to the generating part to minimize the droplet size within a certain range.

Methodology:

Different designs of the structure of the micro-sized channels on chip are from S. van der Graaf, Pinto-Guarneri and Mathias Jeanmart. The following pictures shows a T-junction and two Cross-functins.

Devices in the experiment include a CCD camera for capturing the image, a microscope setup, a syringe pump to control the water flow-rate. The crossing point in the structure on chip where the water and air meet is shown above. The structure has the dimensions as depicted in the picture.

Results:

The water droplets are formed in the outlet channel near the crossing point. Water flow-rate is controlled by the syringe pump and air pressure is estimated at the inlet by the formulas: $p = k$, where $p$ is air pressure and $V$ is the volume while $k$ is a constant value.

The droplets are pictured at the exit point. The following series of pictures is taken on a time domain showing the process of a single droplet from appearing to flowing away. The diameter of the droplet is estimated to be 70 to 80 μm.

Conclusion:

A comparison between different water flow-rates is done to investigate the influence on the droplet size. The following set of pictures show that the water flow-rate does not influence the droplet size significantly when it effects the droplet generating site.

A comparison between different air pressure to investigate the influence on the droplet size. The following representative set of pictures show that as the air pressure increases, the droplet size decreases from 80 μm in the first picture to 40 μm in the last picture.