Microfluidic System For Manufacturing Microspheres For Drug Encapsulation

Microfluidics is the study of fluids as they flow in microstructures. Fluids behave differently at microscales compared to large scale, thus making it a key aspect in scientific research and technology.

The goal of the project is to design a microfluidic system that will be used for manufacturing microspheres for drug encapsulation. The system includes the pump system and the microfluidic chip that generates droplets of drug.

Microfluidic chip proposed to generate drug-encapsulated droplets
Flow-focusing at the junction generates droplets
Serpentine mixer (snake-like turns) enhance mixing

2 inlets (1 for oil, 1 for aqueous drug solution)
150 micron & 250 micron rectangular channels

A microfluidic system for manufacturing microspheres for drug encapsulation is presented. The system comprised of a pump system for driving flow and a microfluidic chip for droplet formation. Microfluidic device will be made using PDMS utilized principles of flow-focusing and serpentine mixing.

References


Design Objectives

- Accurate & Adjustable fluid flow rate (3mL/min to 18mL/min)
- Cost less than $1000
- Microscopic droplet size
- High drug encapsulation efficiency (>90%) into microspheres

Schematic Diagram of the Pump

Future Work

- Build full scale prototype of the pump system be built
- Fabricate the microfluidic chip for droplet formation
- Conduct test to evaluate the pump performance
- Optimization of droplet generation though trials and errors

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