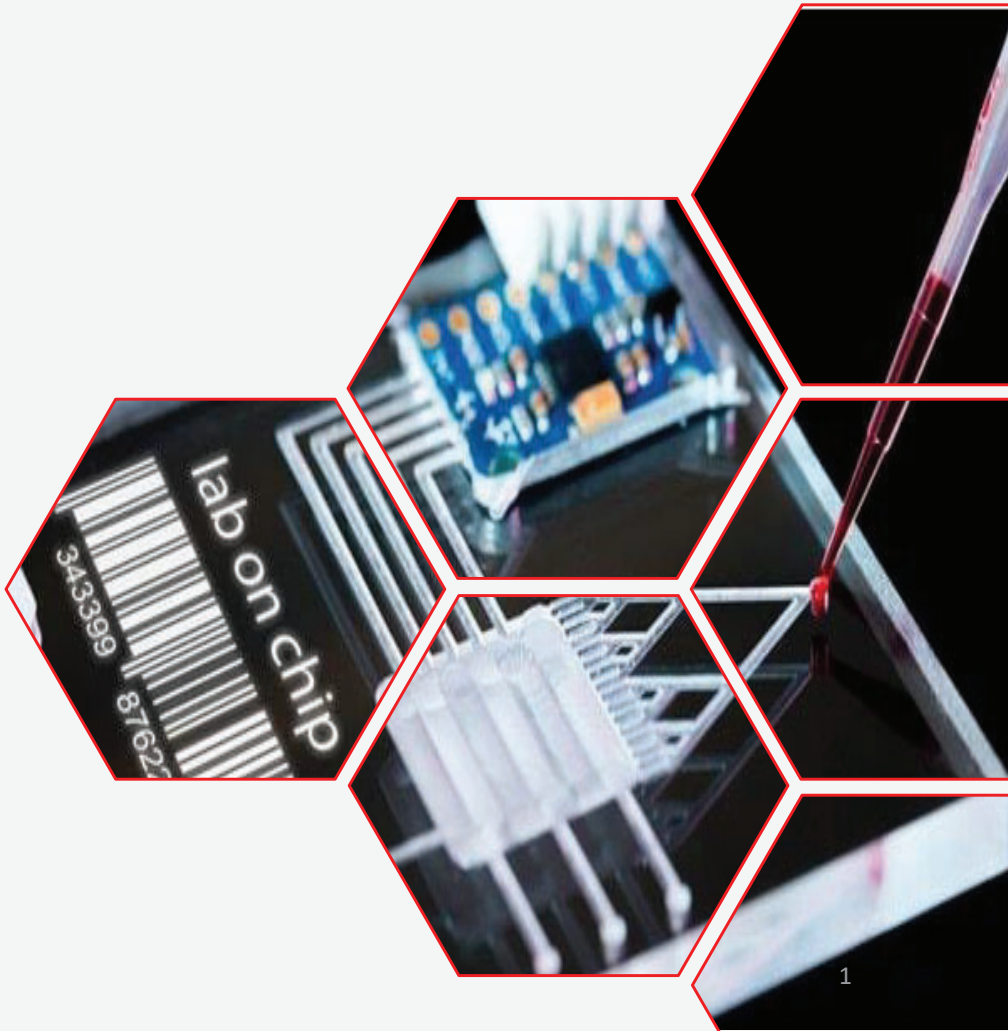
IN THE NAME OF GOD

microfluidic

By :



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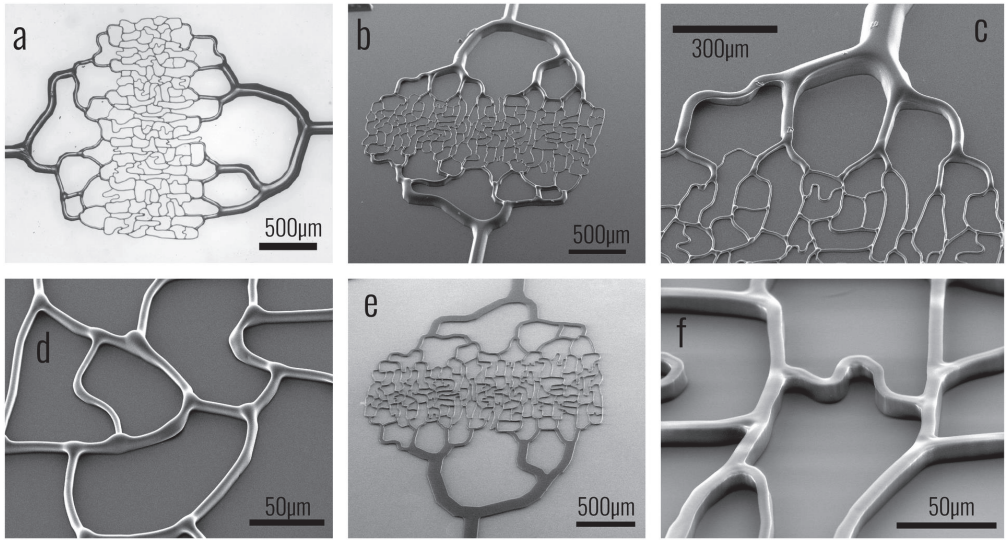
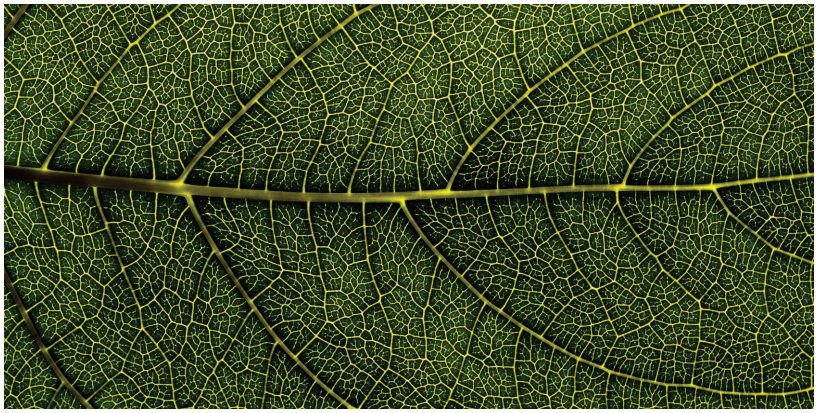
Introduction to microfluidics



Microfluidic blood vessel

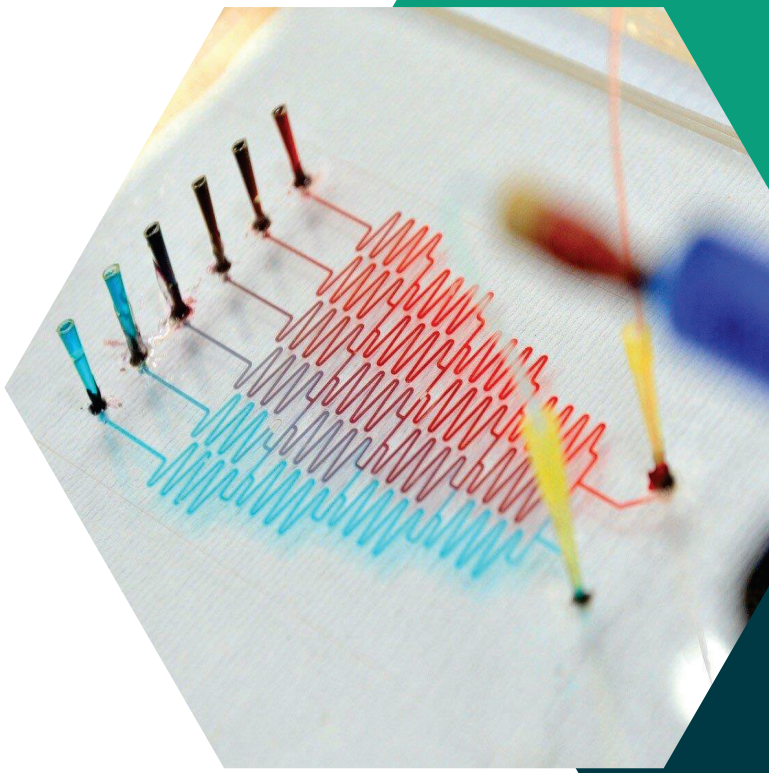


tree leaf under microscope

Introduction to microfluidics

What is microfluidics?

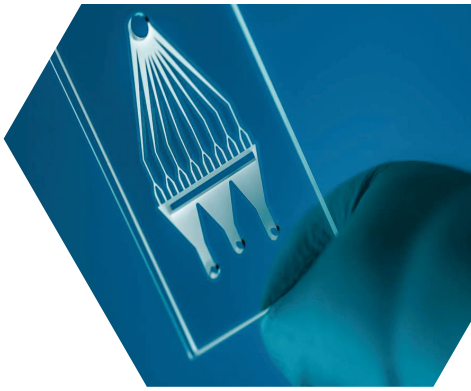
Microfluidics is the study of manipulating fluids on the microscale, typically on the order of micrometers (µm) or even smaller. It is a multidisciplinary field that encompasses the design, fabrication, and analysis of miniature devices used to control, transport, and analyze tiny quantities of fluids.



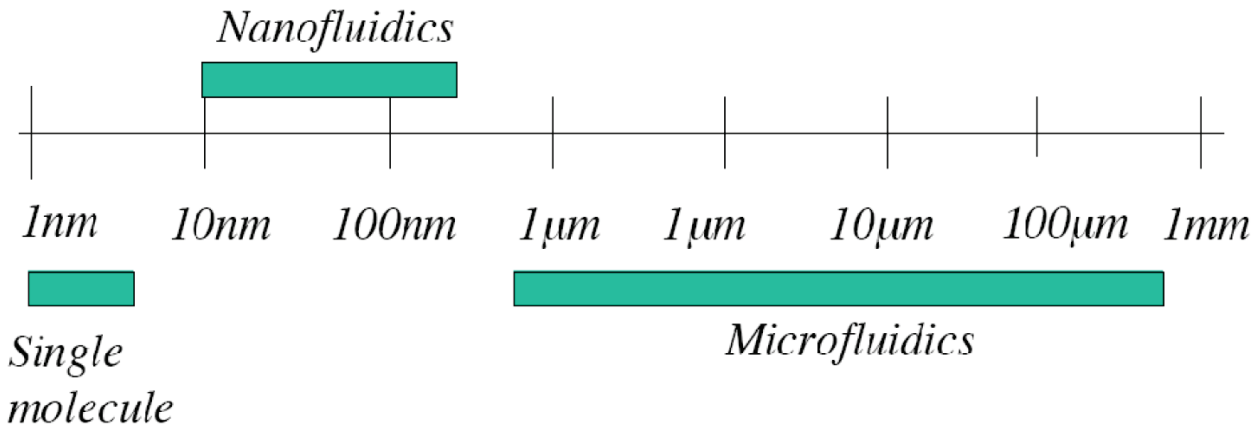
MICRO FLUIDICS

P. Tabeling. Introduction to Microfluidics.

Introduction to microfluidics



The dimensions of microchannels in microfluidics vary widely depending on the specific application and the desired flow rate and mixing efficiency. However, in general, microchannels typically range from a few micrometers to a few tens of micrometers in depth, width, and height.



P. Tabeling. Introduction to Microfluidics.

Introduction to microfluidics

1-Why should we use microfluidic methods?

2-Why should we work on a micro scale?

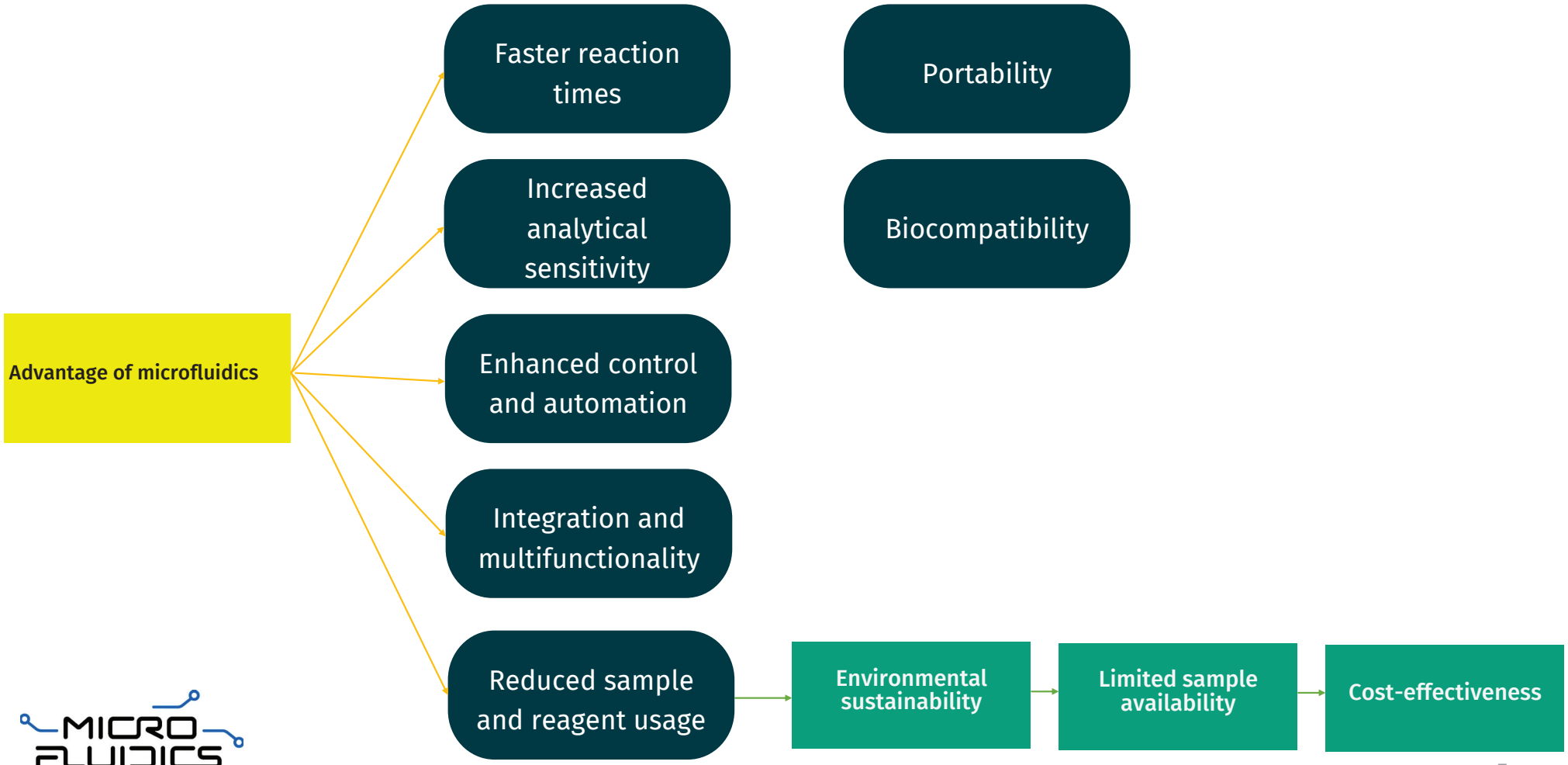
3-What are the advantages of scaling down that we go for these methods?

4-Why don't we do laboratory work in a larger volume and work on a microliter scale?

5-What challenges and limitations are associated with scaling down laboratory processes to the microfluidic level?

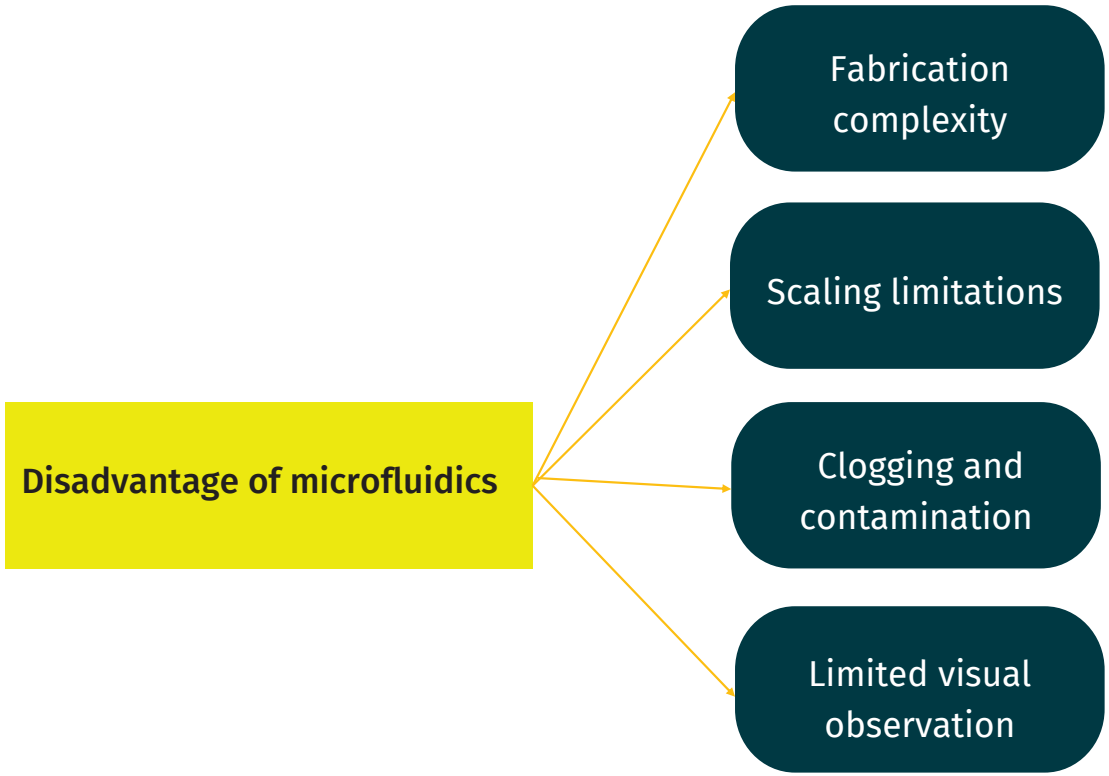
MICRO FLUIDICS

Introduction to microfluidics



P. Tabeling. Introduction to Microfluidics.

Introduction to microfluidics



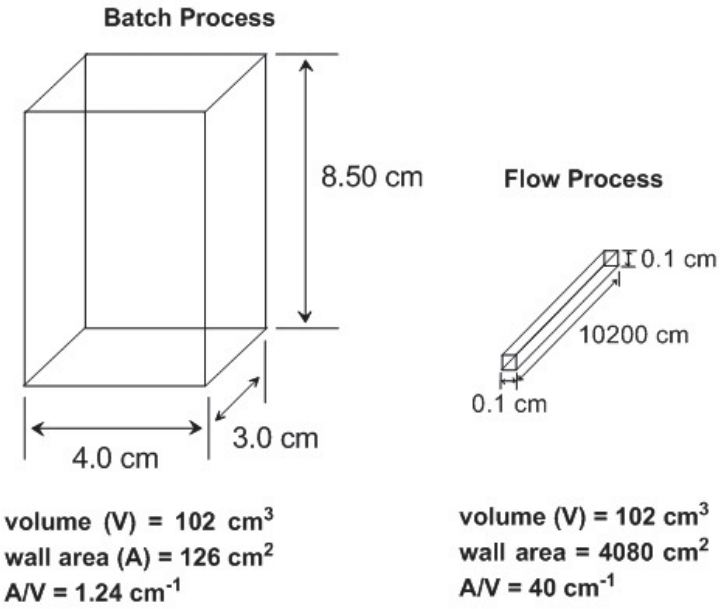
Physics of microfluidics

Physics of microfluidics

properties in microfluids differ significantly from the "normal state" of bulk fluids

due to the extremely small dimensions (micrometers) of microfluidic channels

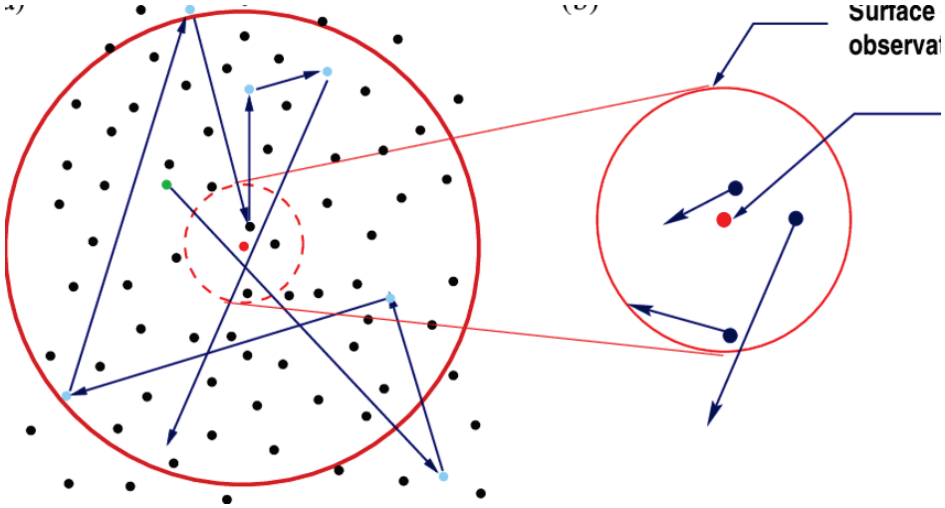
Dominant Surface Forces
Heat and Mass Transfer
Capillary forces



Physics of microfluidics

Non-Continuum

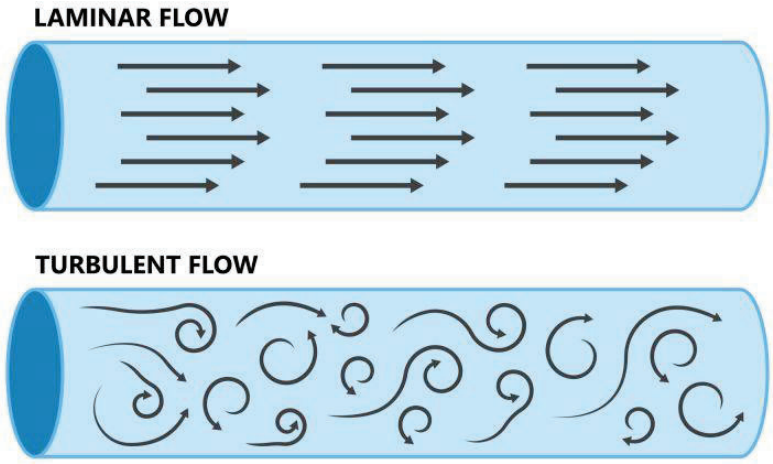
mean free path (MFP)



Physics of microfluidics

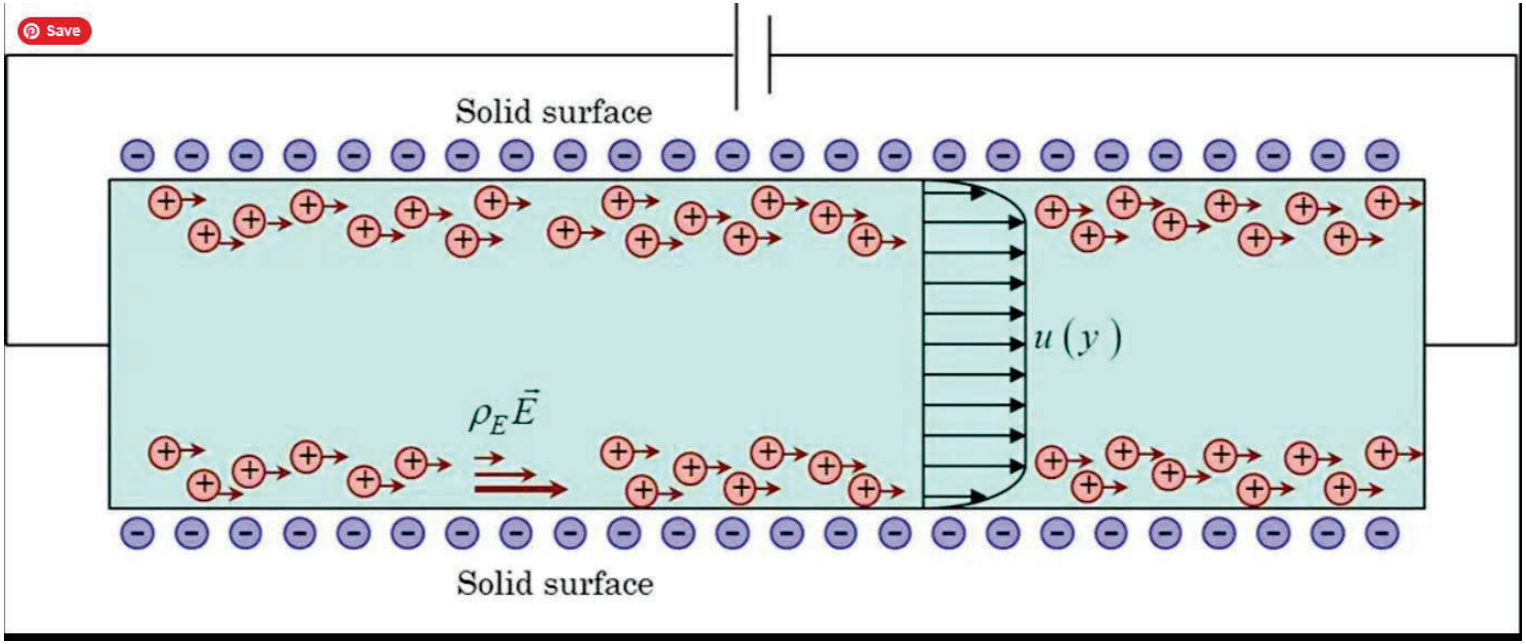
Laminar Flow and Mixing

$$Re = \frac{\nu D \rho}{\mu}$$



Physics of microfluidics

Electrokinetic phenomena



Microchips design

Types of Microfluidic Devices Configurations

In microfluidic devices, the channel design will depend on the device's function, and devices can come up with various types of channels. Some types of channels are straight, Y-form, T-junction, spiral, cross-junction, flow-focusing, division, serpentine, and microchambers .Devices with spiral and Y channels are commonly used for separations (although Y channels are used for combining fluids as well). To carry out the mixing of fluids, a serpentine design is employed, and the division channels are used for splitting fluids. T-junction, cross-junctions, and flow-focusing are commonly used in microdroplet devices, and in microchambers, physical, chemical, and biological reactions are performed