

LOSCHMIDT
LABORATORIES



Molecular Biotechnology

Microfluidics & Lab-on-chip, 25/11/2020

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Organization info

Protocol

- 1 DOC/PDF document (name/date – see template in study materials)
- Homeworks (from Textbook)
- Analyzed data from this exercise (2 microfluidic platforms)
- Deadline: **9/12/2020 23:59** (Homework vaults)

1. Enzyme activity platform (Dropix)

1. Introduction & data collection
2. Exercise: Data analysis

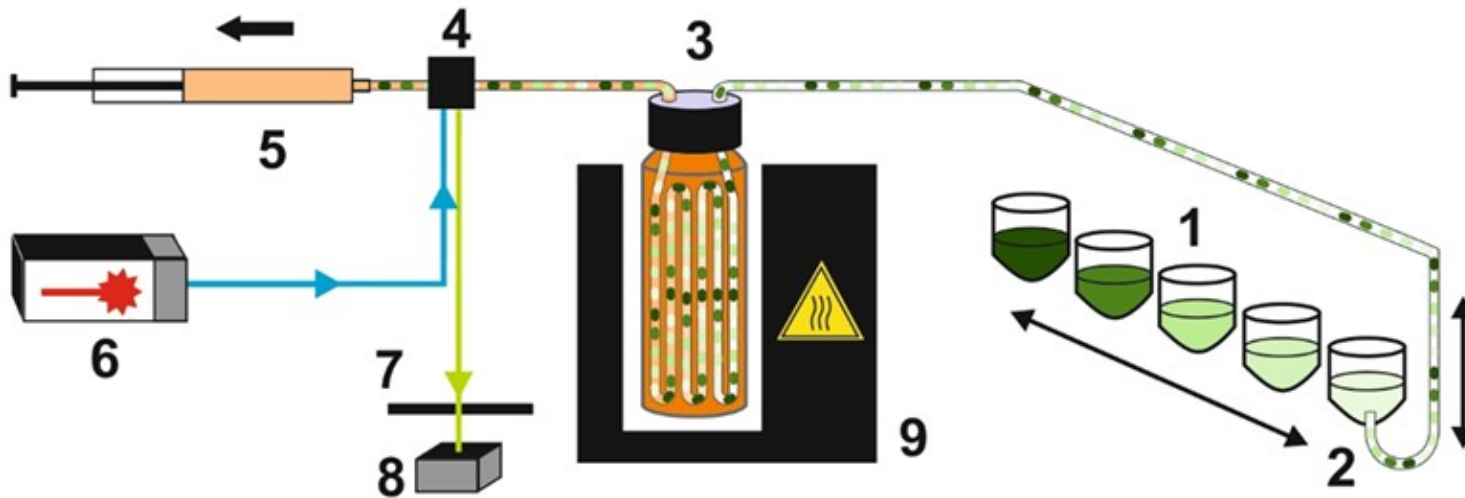
2. Enzyme kinetics platform (CBMP)

1. Introduction & data collection
2. Exercise: Data analysis

1. Enzyme activity platform (Dropix)

Dropix enzyme activity platform

- Capillary droplet microfluidic platform for enzyme activity characterization

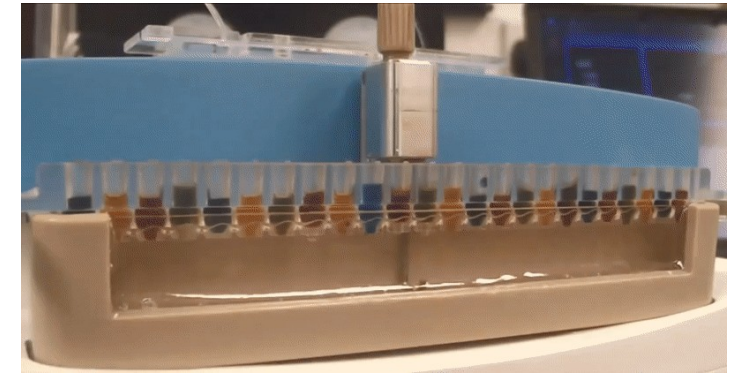
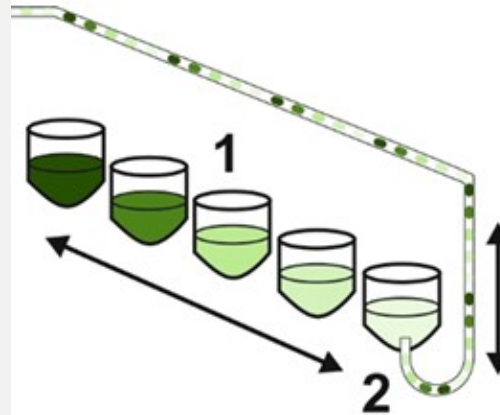


- 1 – sampler
- 2 – droplet generator
- 3 – incubation/substrate chamber
- 4 – detection cube
- 5 – syringe pump

- 6 – laser source
- 7 – cut-off filter
- 8 – detector
- 9 – temperature controller

Dropix microfluidic platform

- Capillary droplet microfluidic platform for enzyme activity characterization

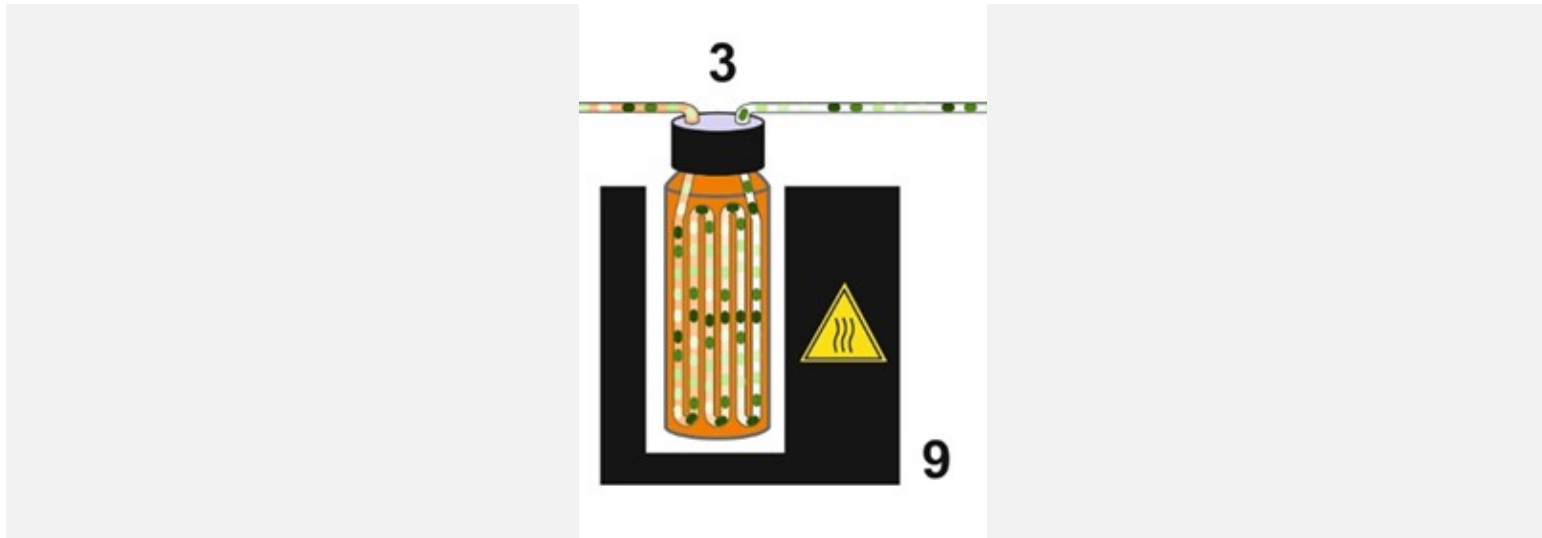


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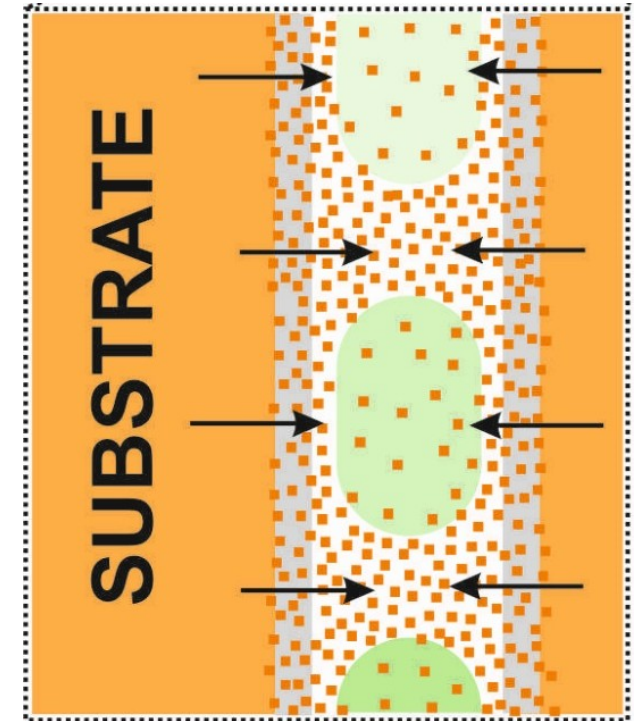
Dropix microfluidic platform

- Capillary droplet microfluidic platform for enzyme activity characterization



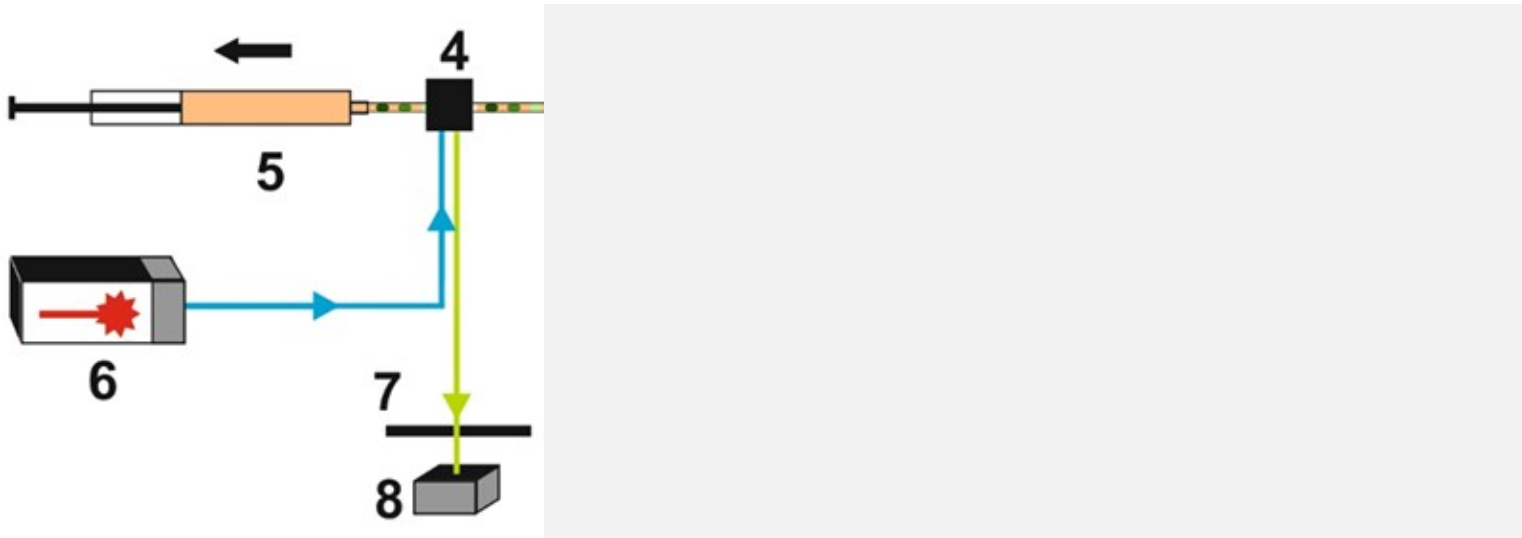
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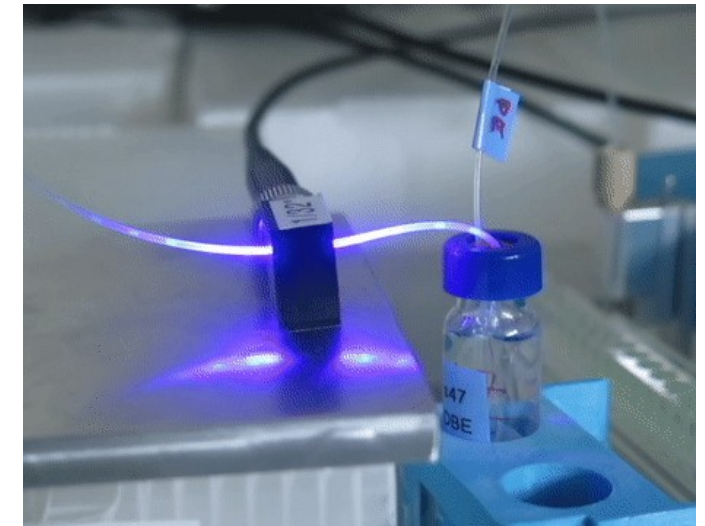
Dropix microfluidic platform

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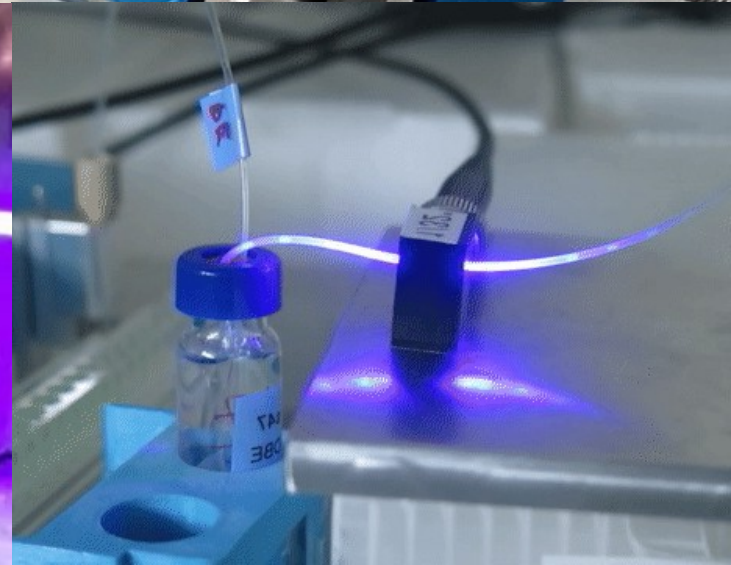
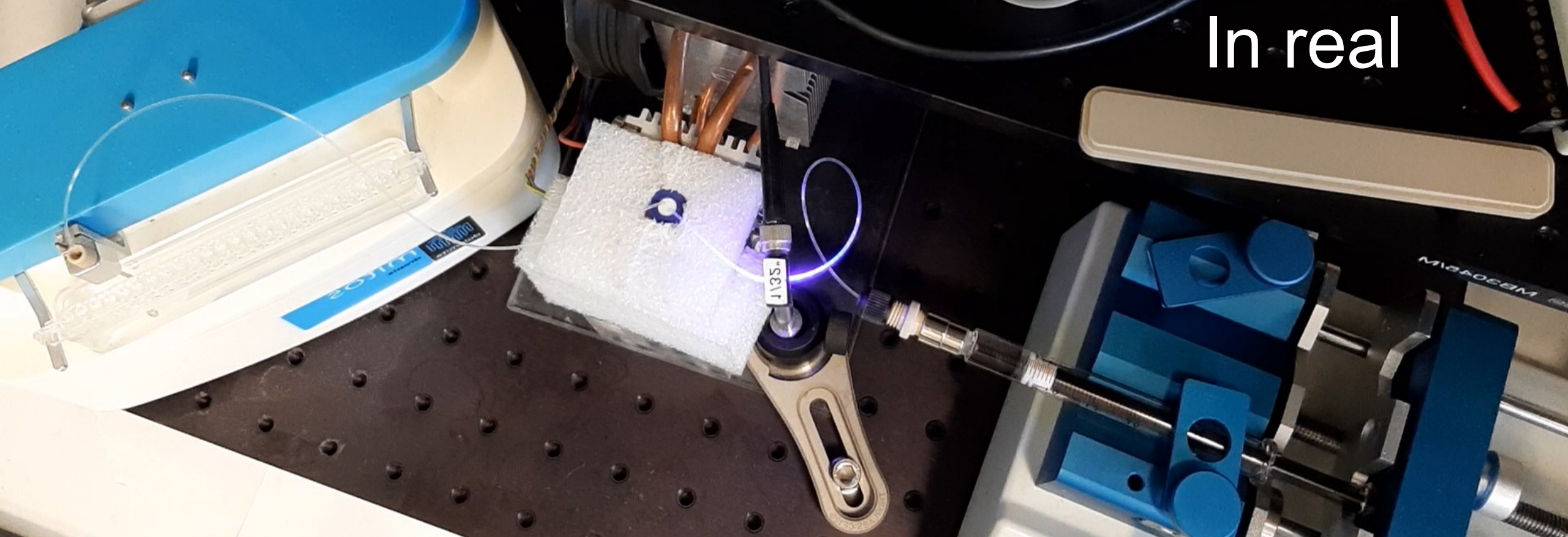


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In real



Data collection

DROPIX SETUP

COM8 Serial port

100 Tube ID (um)

10 Flow rate (ul/min)

1 Rack type

17 calculated minimum drop volume (nl)

MANUAL CONTROL

Initialise Calibrate Stop

	Set (raw)	Actual (calibrated)	Status	Well
Y (mm)	0.00	-0.90	idle	0
Z (rad)	0.00	0	idle	

ADMIN

QUIT

comms error

status	code
<input checked="" type="checkbox"/>	d0

source

reset

AUTO CONTROL

Start Abort

00:04:45 est. total time left (s)

0 current iteration

0 current step

0 droplets left in step

AUTOMATIC SEQUENCE SETUP

Sequence table iterations 1

Step#	Well#	Aq. vol. (nl)	Oil vol. (nl)	Quantity
1	2	150	300	10
2	4	150	300	10
3	6	150	300	10
4	8	150	300	10
5	10	150	300	10
6	12	150	300	10
7	14	150	300	10
8	16	150	300	10
9	18	150	300	10
10	20	150	300	10

Update Clear

Import Export

BETA TEST ONLY

f/w version: 3.08

unit s/n: 0

app version: v0.15

- drop volumes okay
- quantities okay
- wells okay



Signal Voltage

0.0151256

Recording time

1200

Waveform Graph

Plot 0



1. Exercise

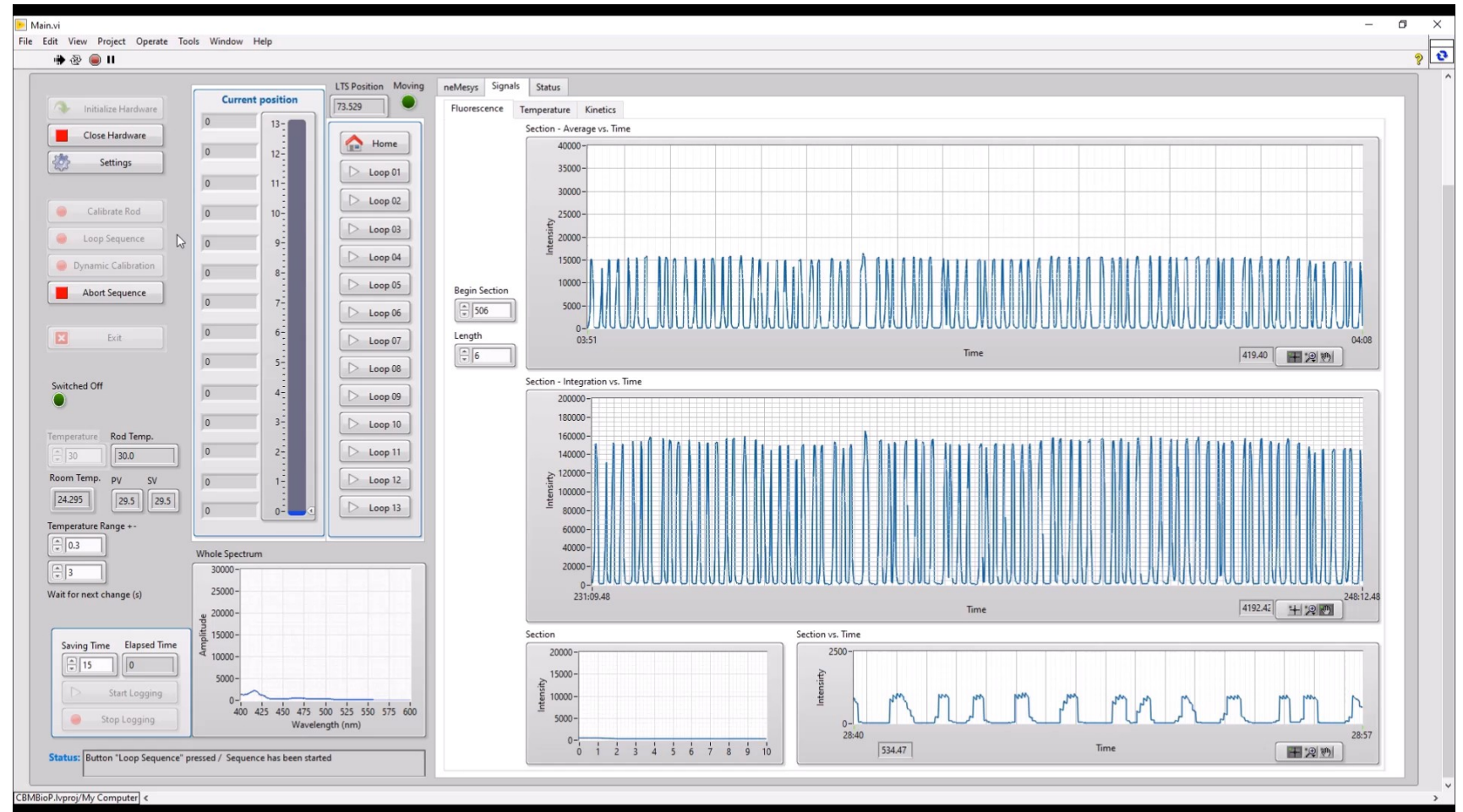
[Sample_dataset_Dropix.xlsx](#)

Protocol requirements

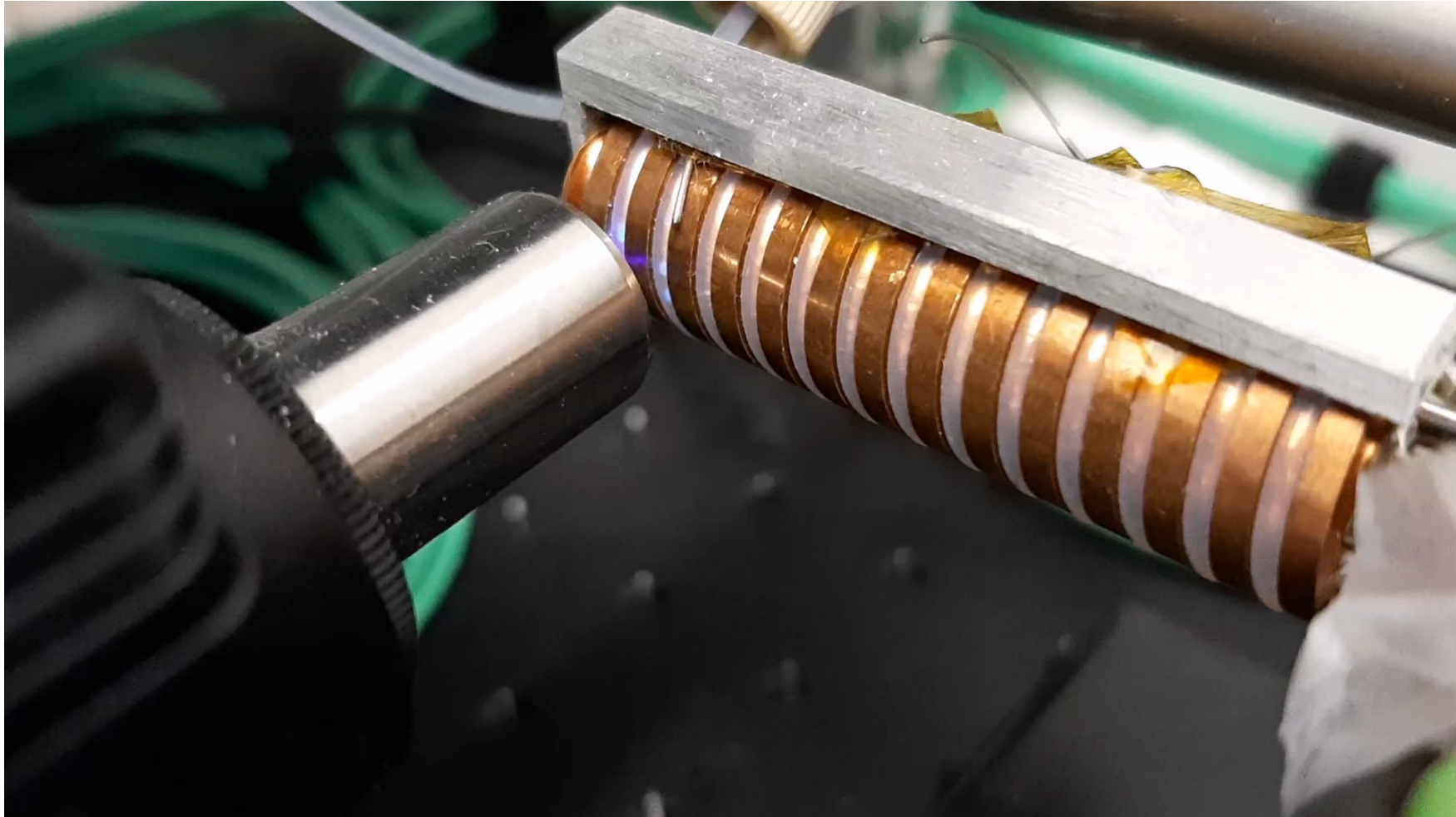
- Graph: calibration curve
- Product concentration for Enzyme 1 & Enzyme 2
- Specific activities of Enzyme 1 & Enzyme 2
- Comparison (short conclusion)

2. Enzyme kinetics platform (CBMP)

CBMP – Capillary Bioplatfrom



„Droplet Train“



2. Exercise

[Sample_dataset_CBMP.xlsx](#)

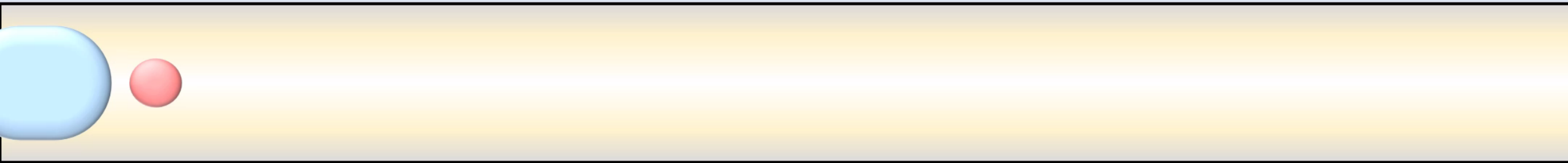
Protocol requirements

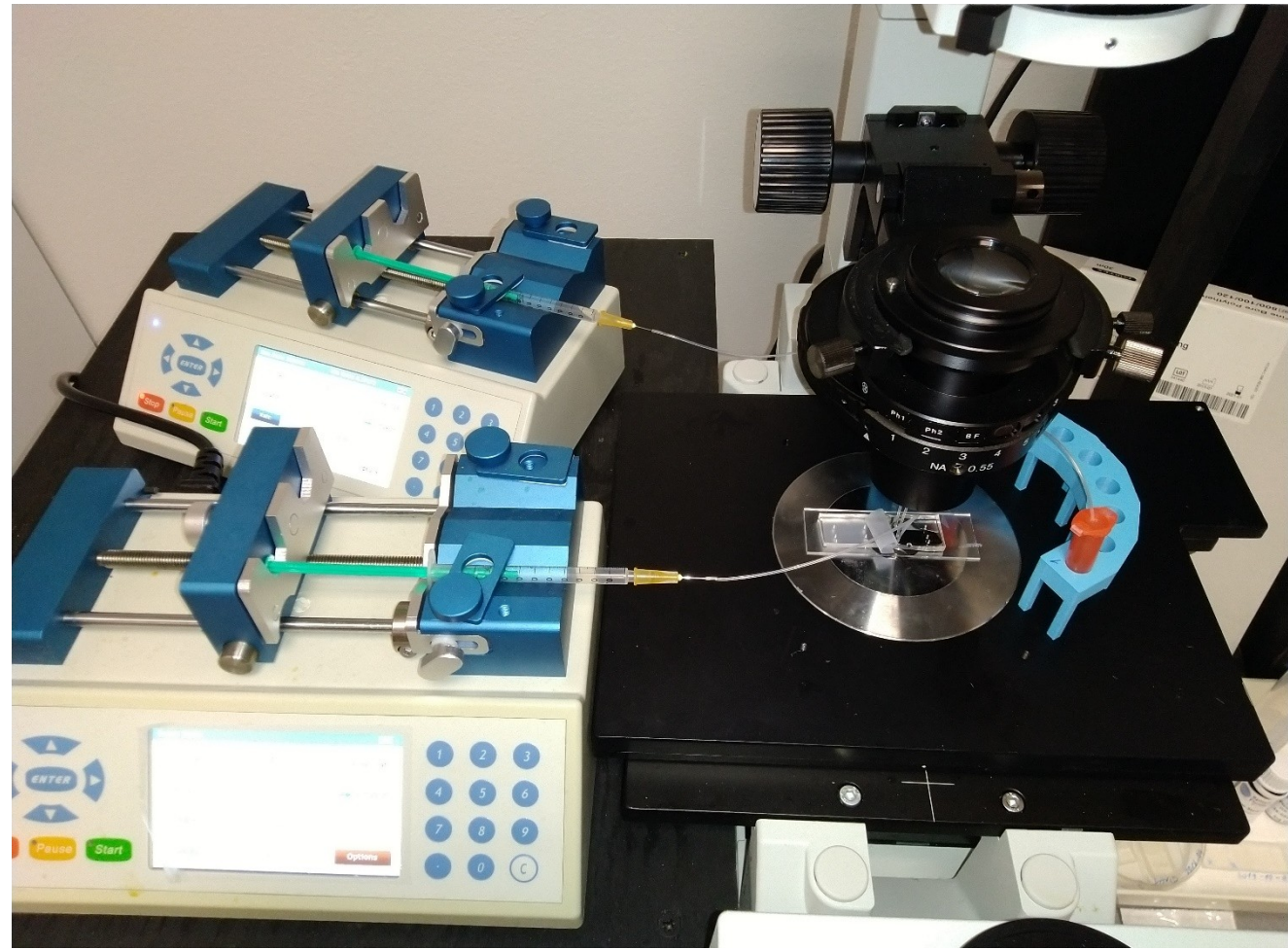
- Graphs: calibration curve; progress reaction curves
- Bonus: calculate kinetic parameters of Enzyme 3

Homework

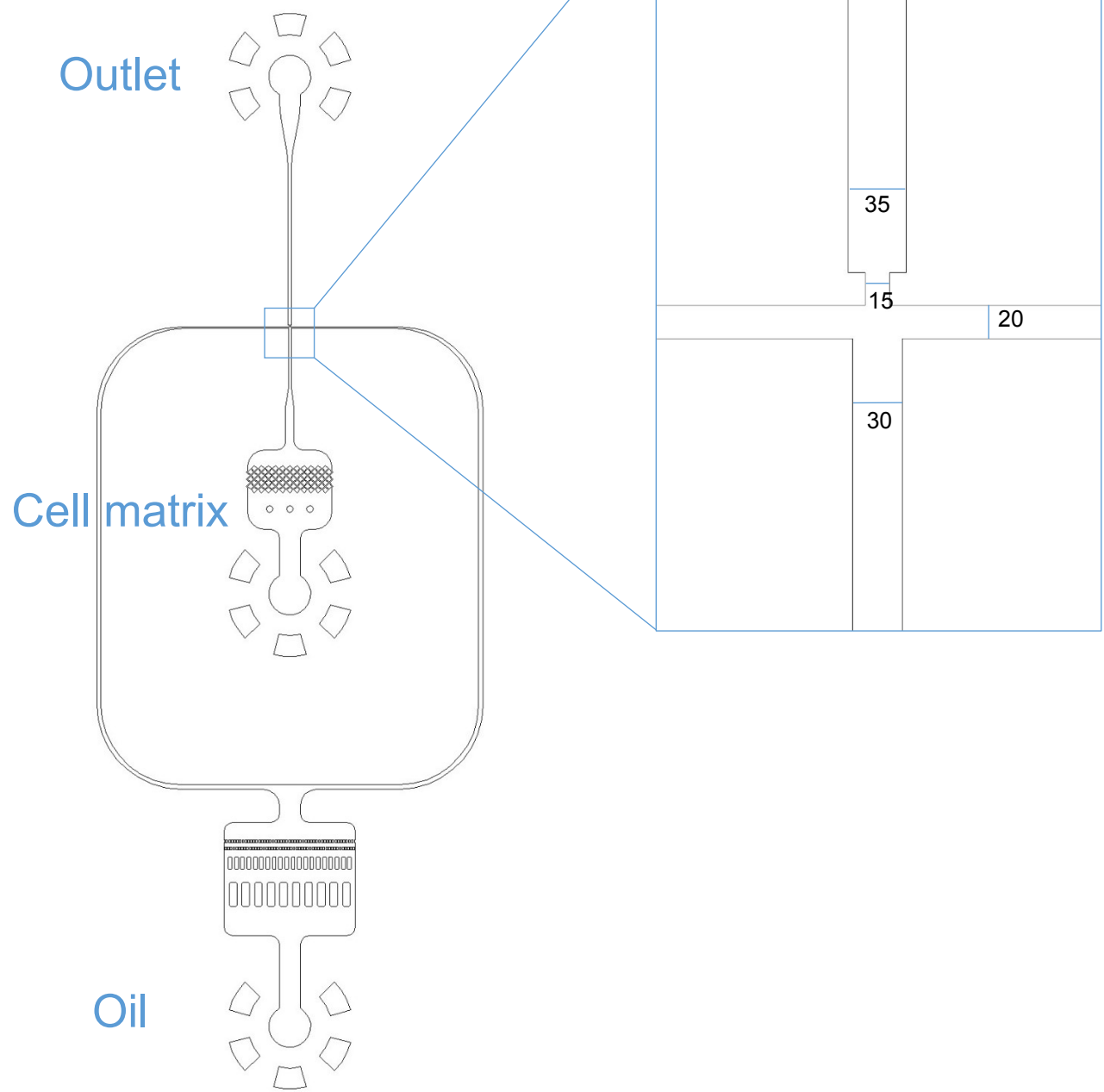
Droplet merging (homework)

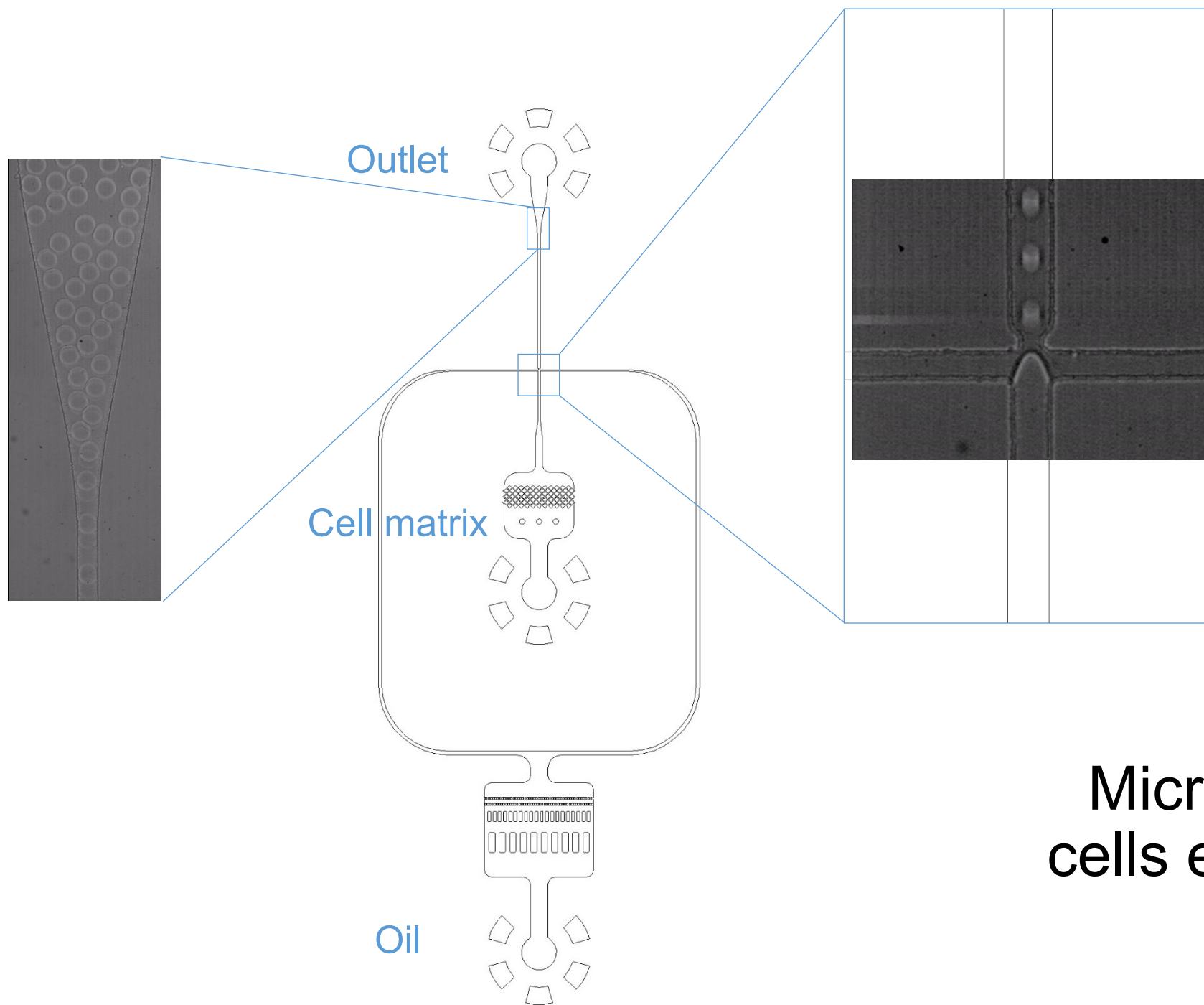
Low flow rate



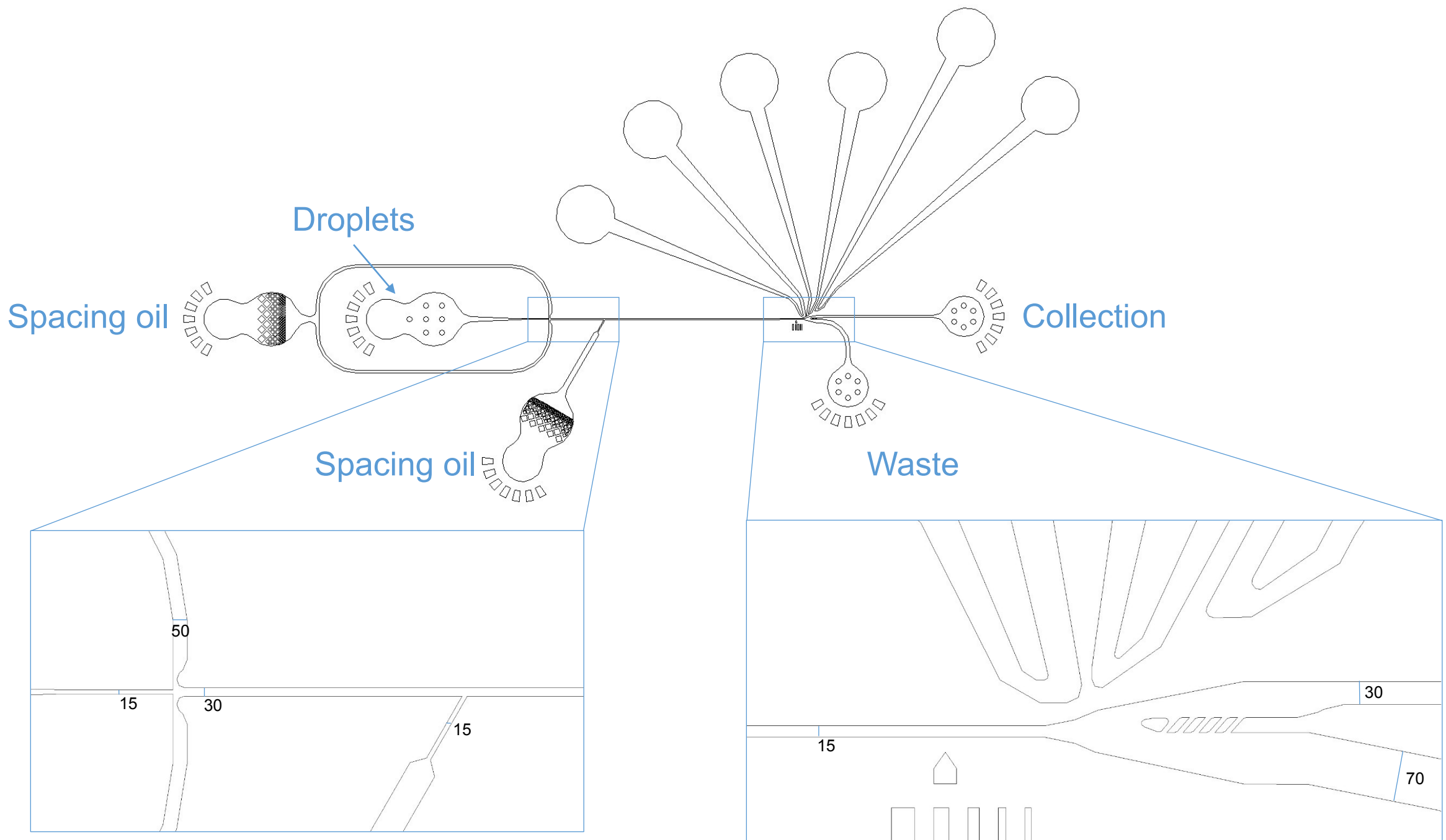


Inverted microscope / Olympus

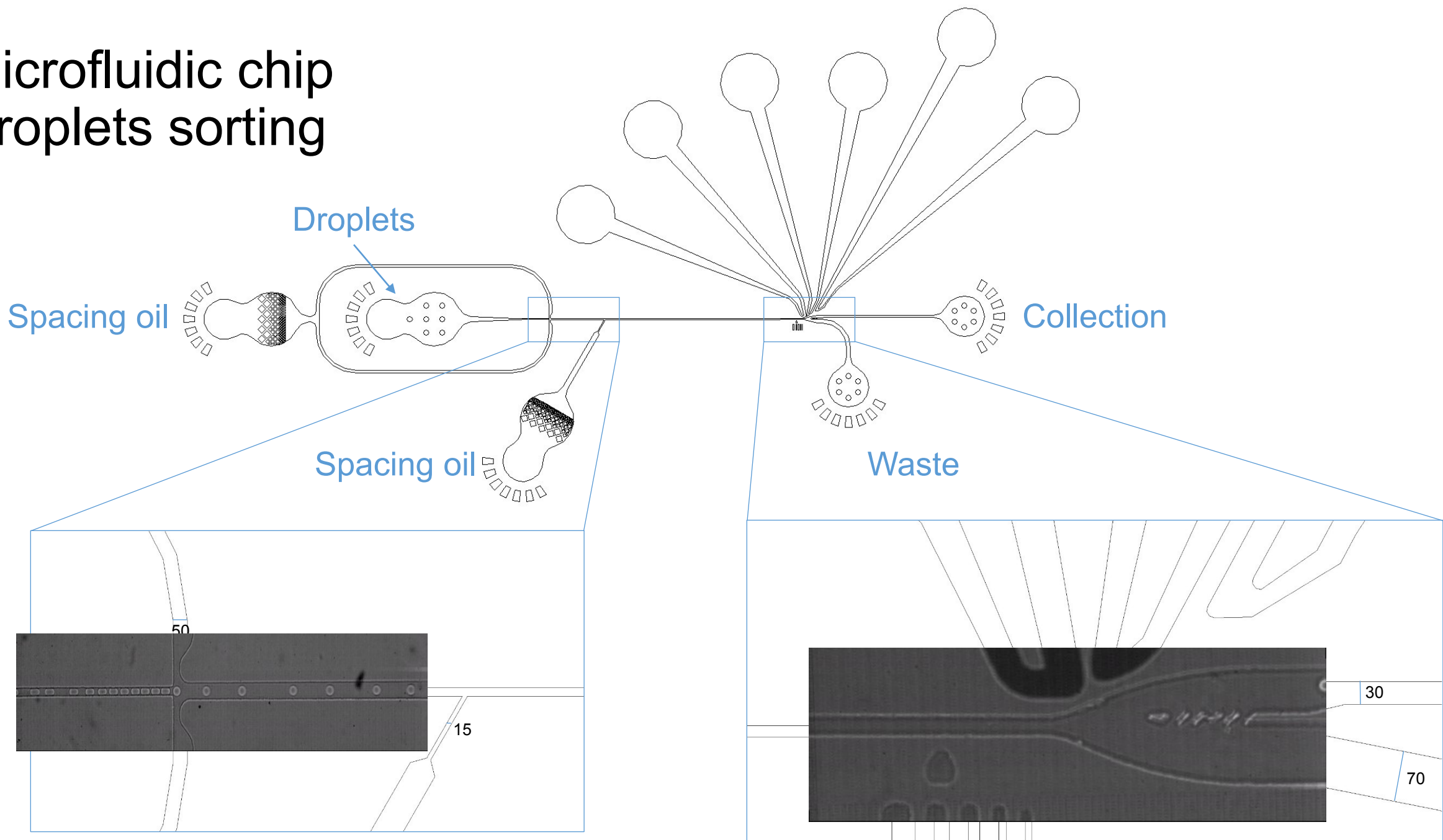




**Microfluidic chip
cells encapsulation**

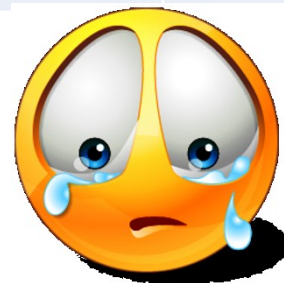


Microfluidic chip droplets sorting



Batch-based screening process vs. FADS (or FACS)

	Time needed for library 10^6 (10^8 colonies)	
	<u>Plate based screening</u>	<u>FADS</u>
Transformation	1.5 h	1.5 h
Cultivation on agar plates	12h	not necessary
Colony isolation	1-2 h	not necessary
Cultivation in broth	16 h	6-12 h
IPTG Induction	5 h	4-6 h
Harvesting	0.5 h	0.2 h
Assay + Substrate adding	1 h	0.1 h (matrix preparation)
Incubation	16 h	16 h
Measurement	0.25 h	---
Encapsulation	---	8 h
Sorting	---	14 h at 2 kHz



**570 years
continuously
6 people**

**15 days
continuously
1 people**

