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)

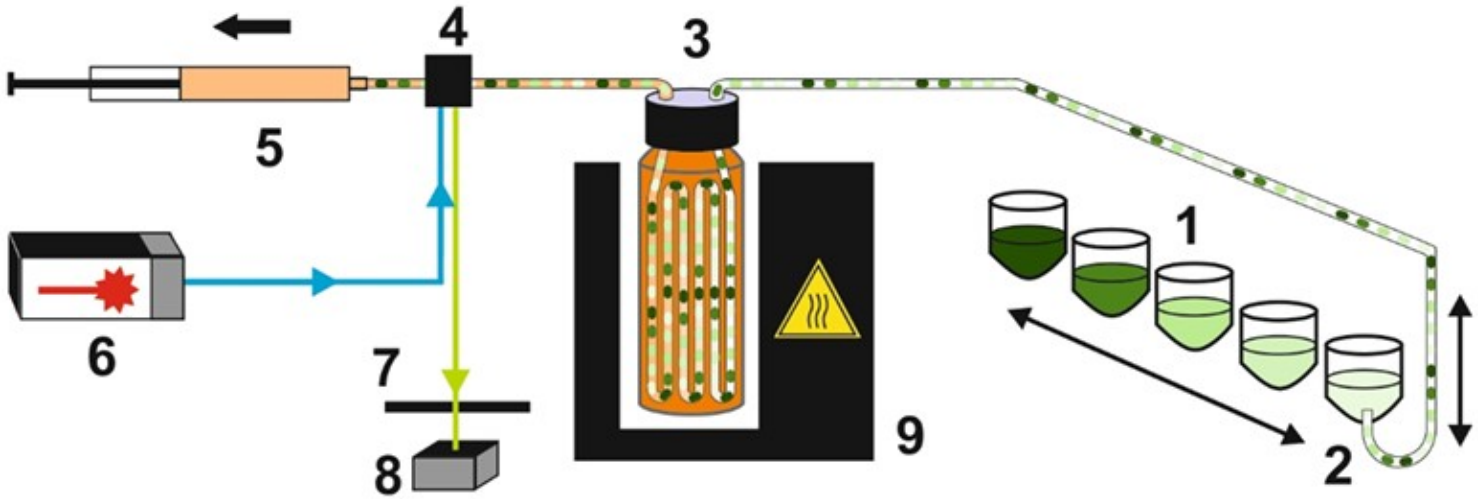
1. Enzyme activity platform (Dropix)
    1. Introduction & data collection
    2. Exercise: Data analysis

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

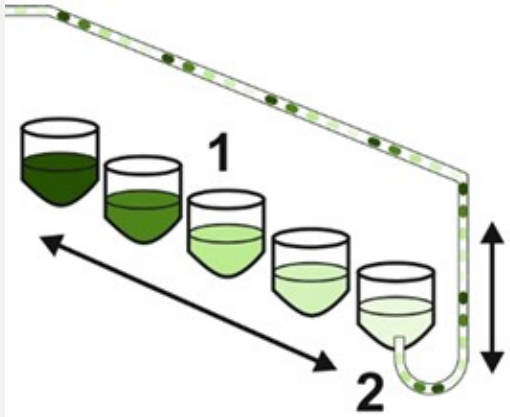


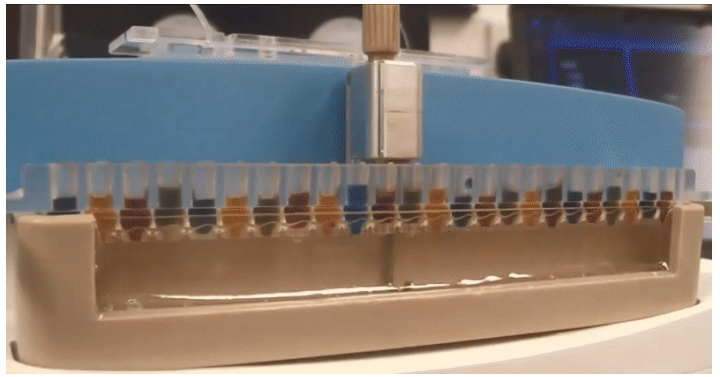
1 – sampler
2 – droplet generator
3 – incubation/substrate chamber
4 – detection cube
5 – syringe pump
6 – laser source
7 – cut-off filter
8 – detector
9 – temperature controller

Anal.Chem. 2019, 91, 10008−10015

Dropix microfluidic platform

- Capillary droplet microfluidic platform for enzyme activity characterization





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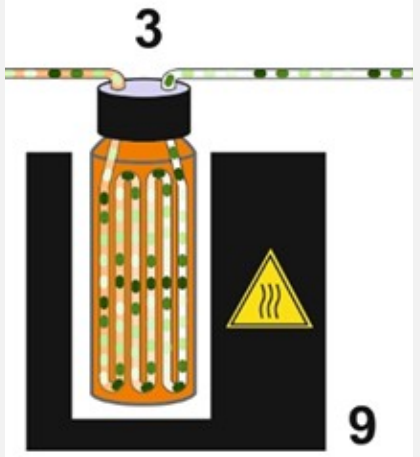

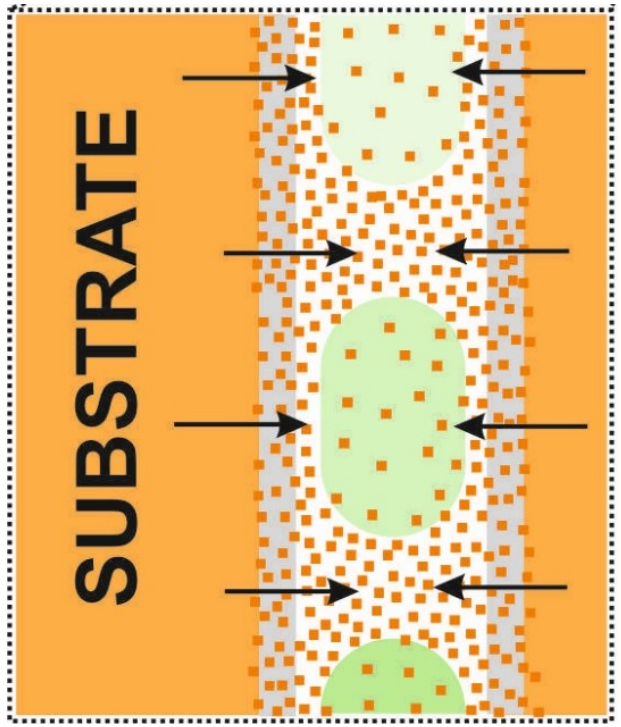

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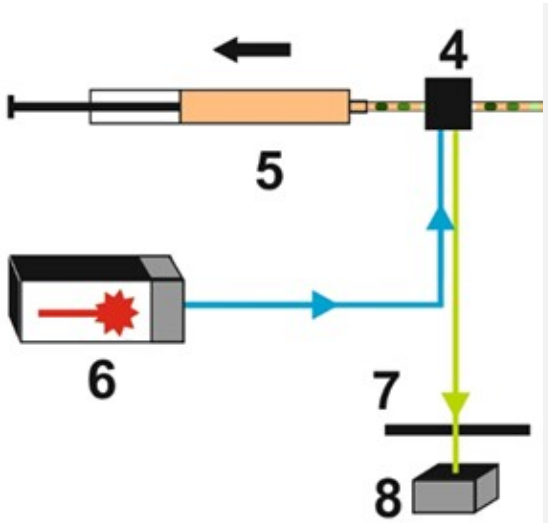

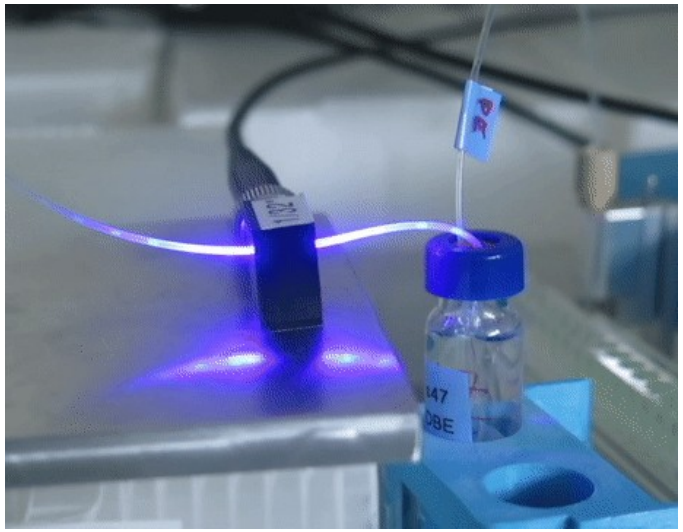

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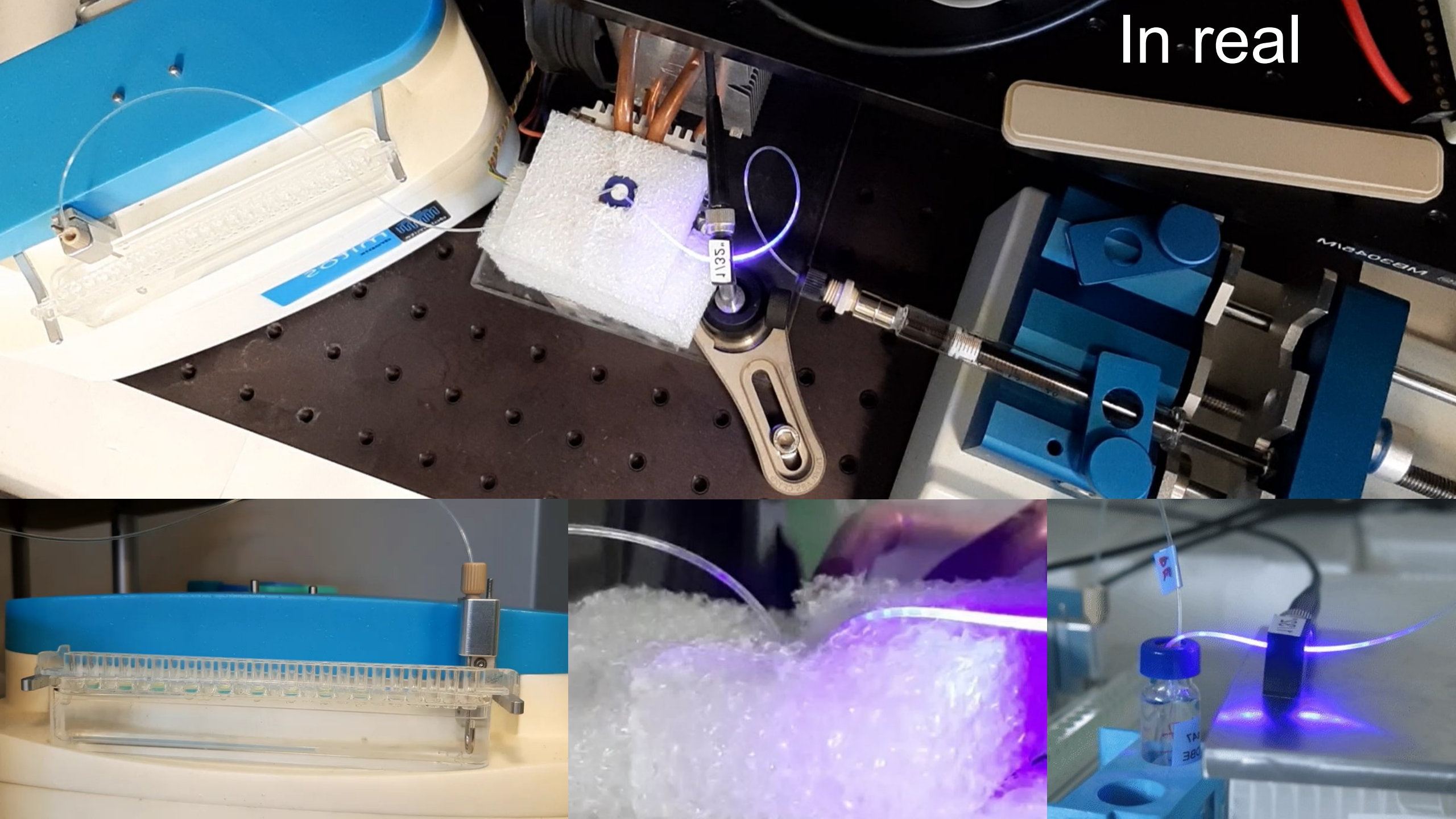
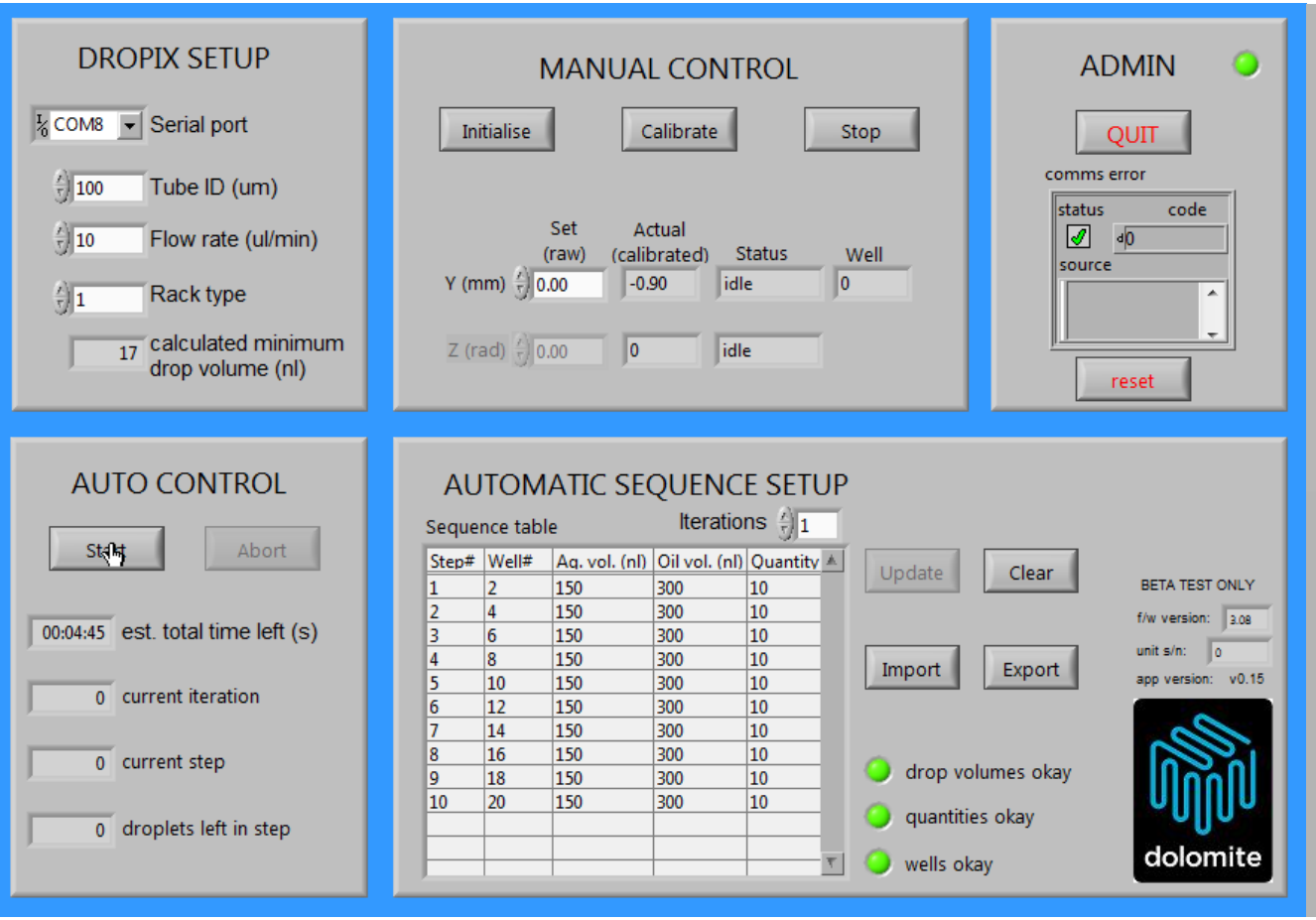
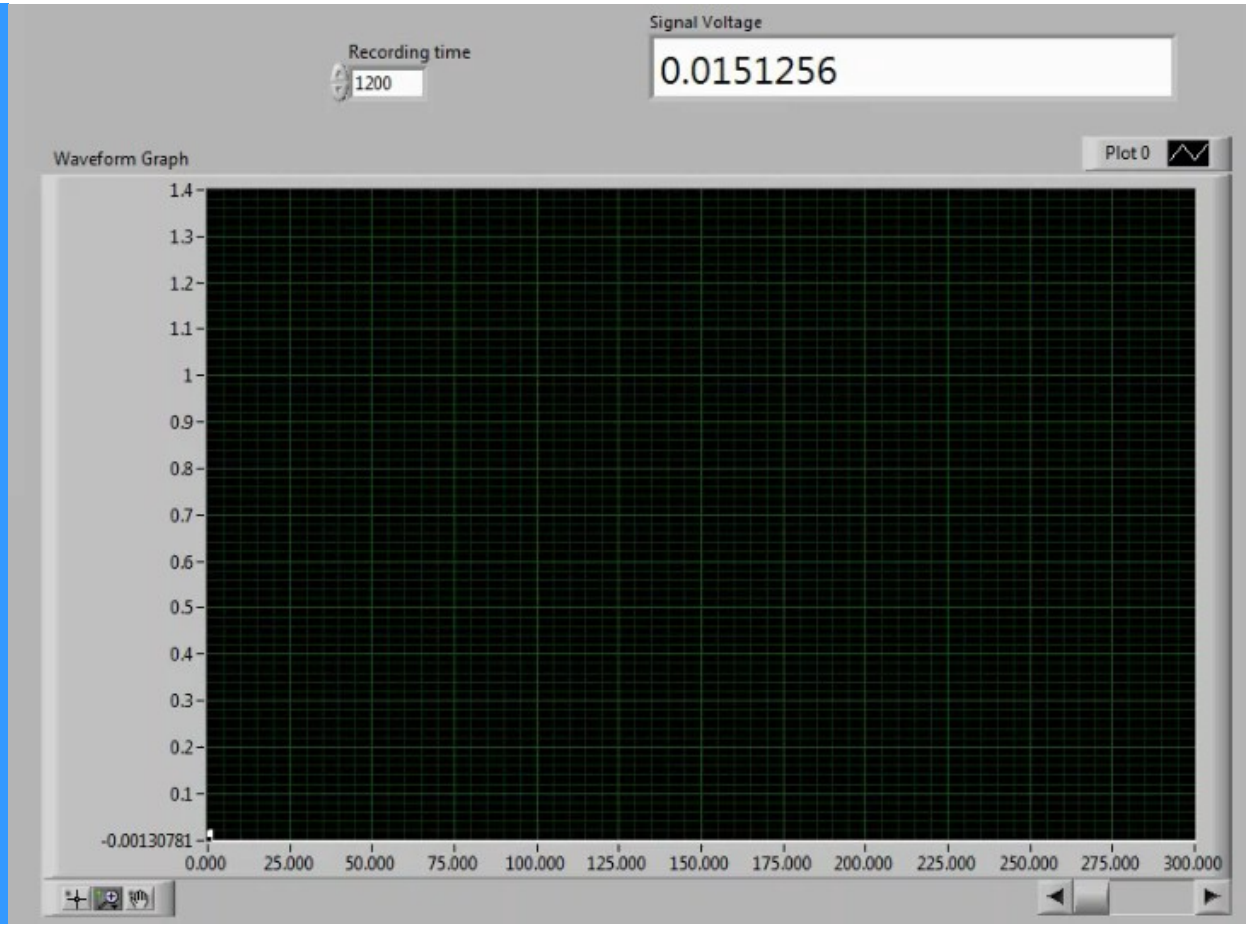

In real

Data collection





1. Exercise

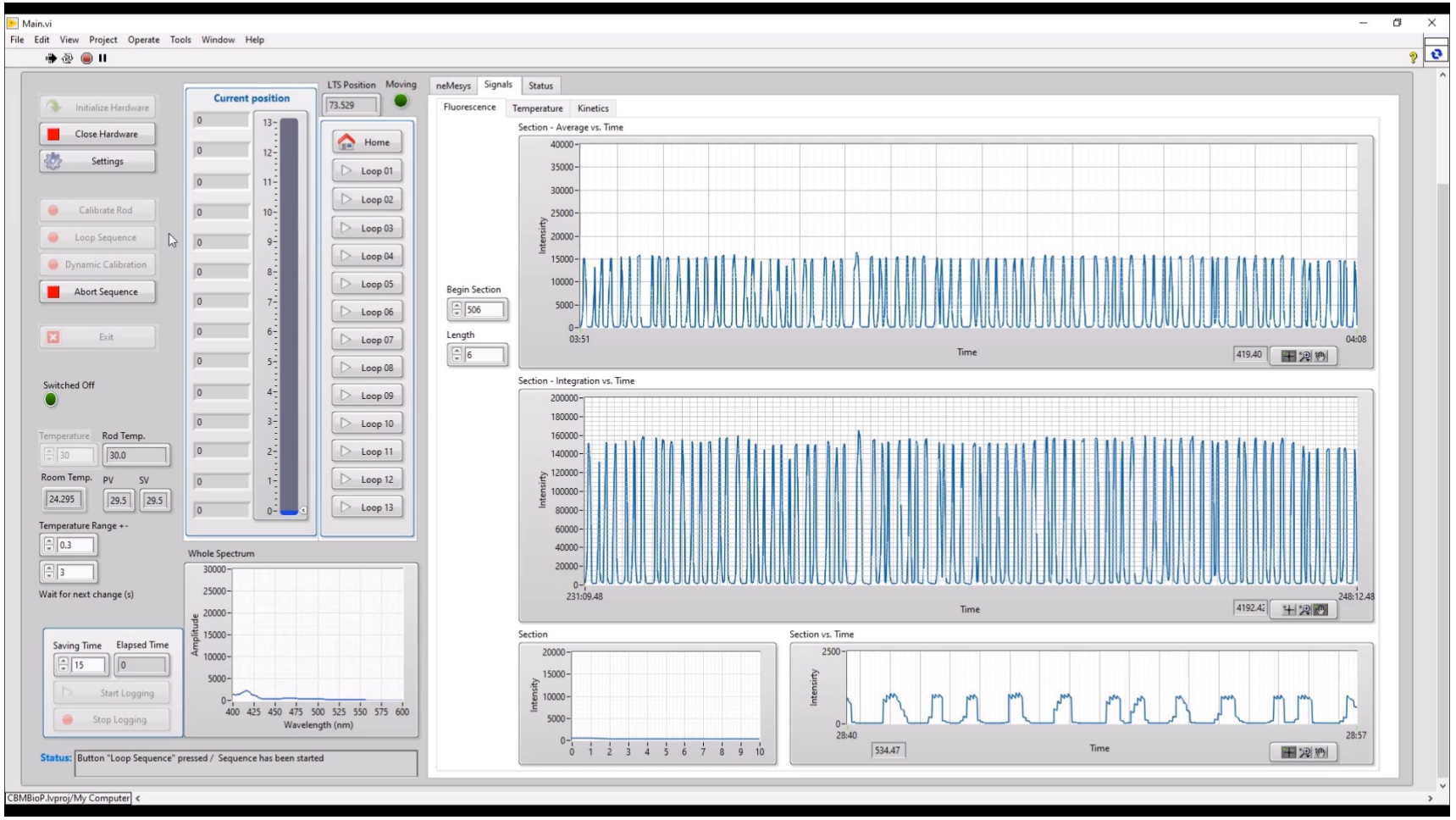
Sample_dataset_Dropix.xlsx

Protocol requirements

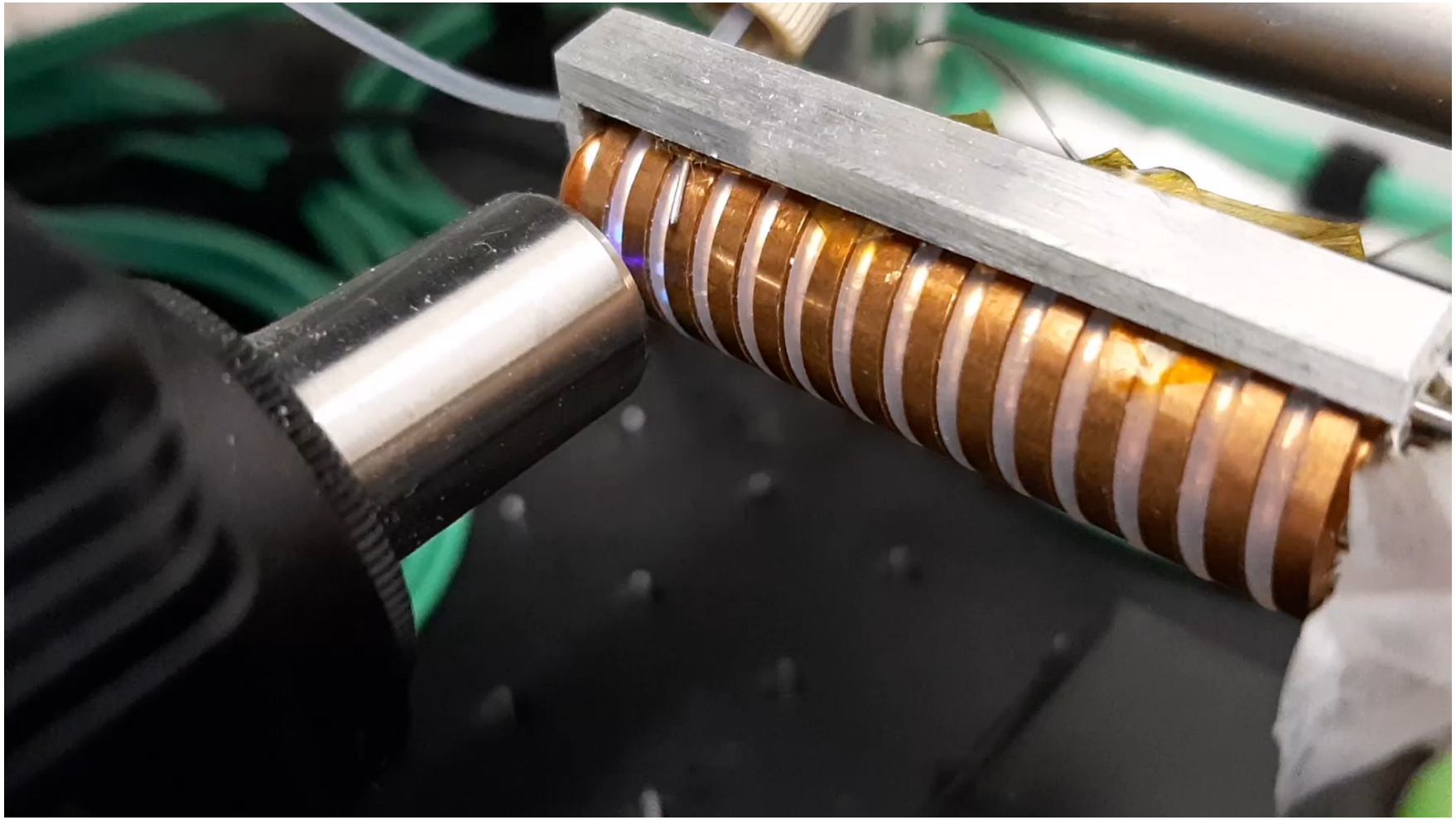
- Graph: calibration curve
- Product concentration for Enzyme 1 & Enzyme 2
- Specific activities of Enzyme 1 & Enzyme 2
- Comparison (short conclusion)

2. Enzyme kinetics platform (CBMP)

CBMP – Capillary Bioplatform



„Droplet Train“



2. Exercise

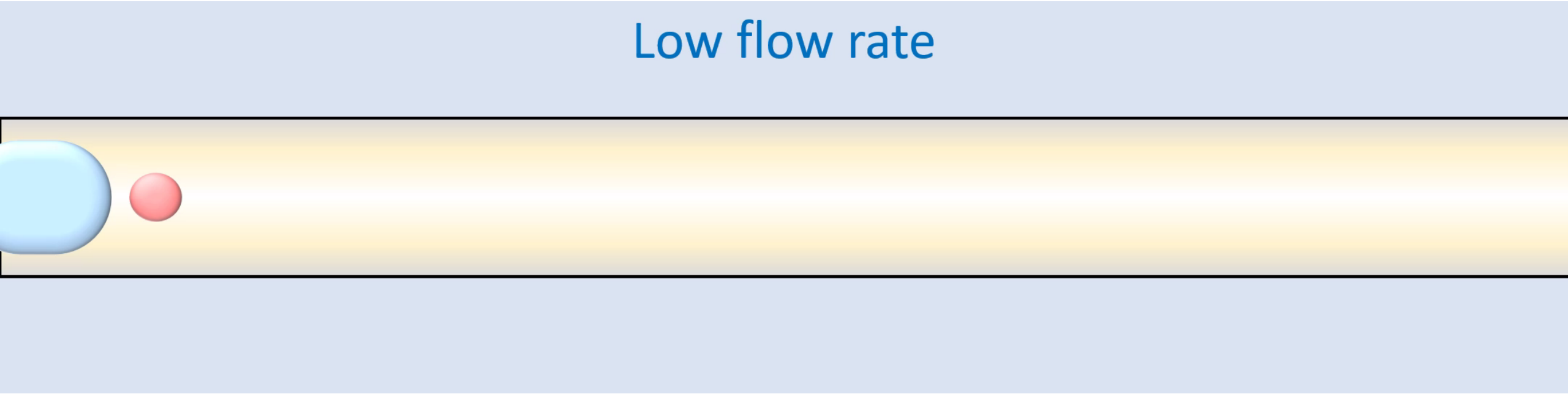
Sample_dataset_CBMP.xlsx

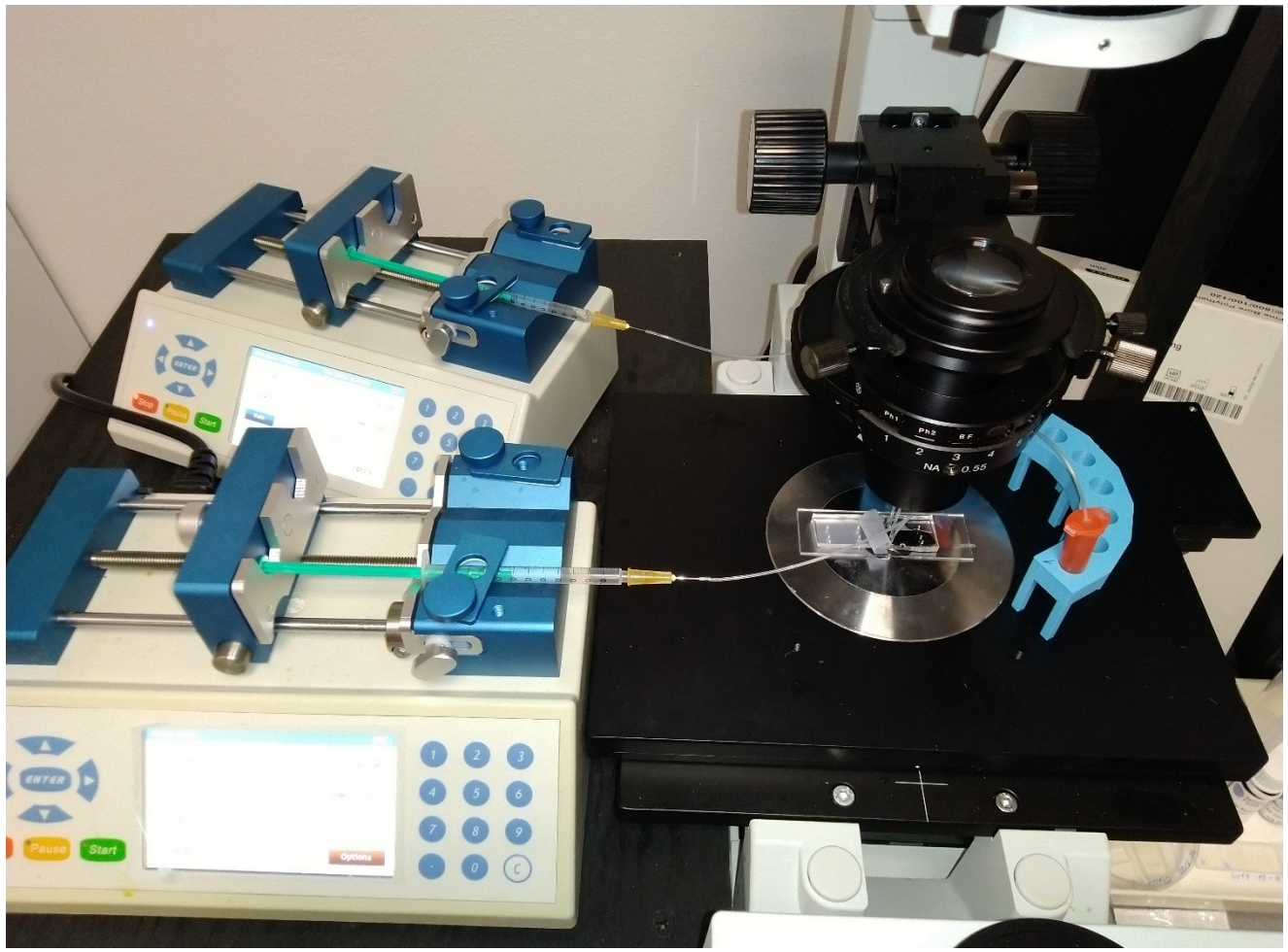
Protocol requirements

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

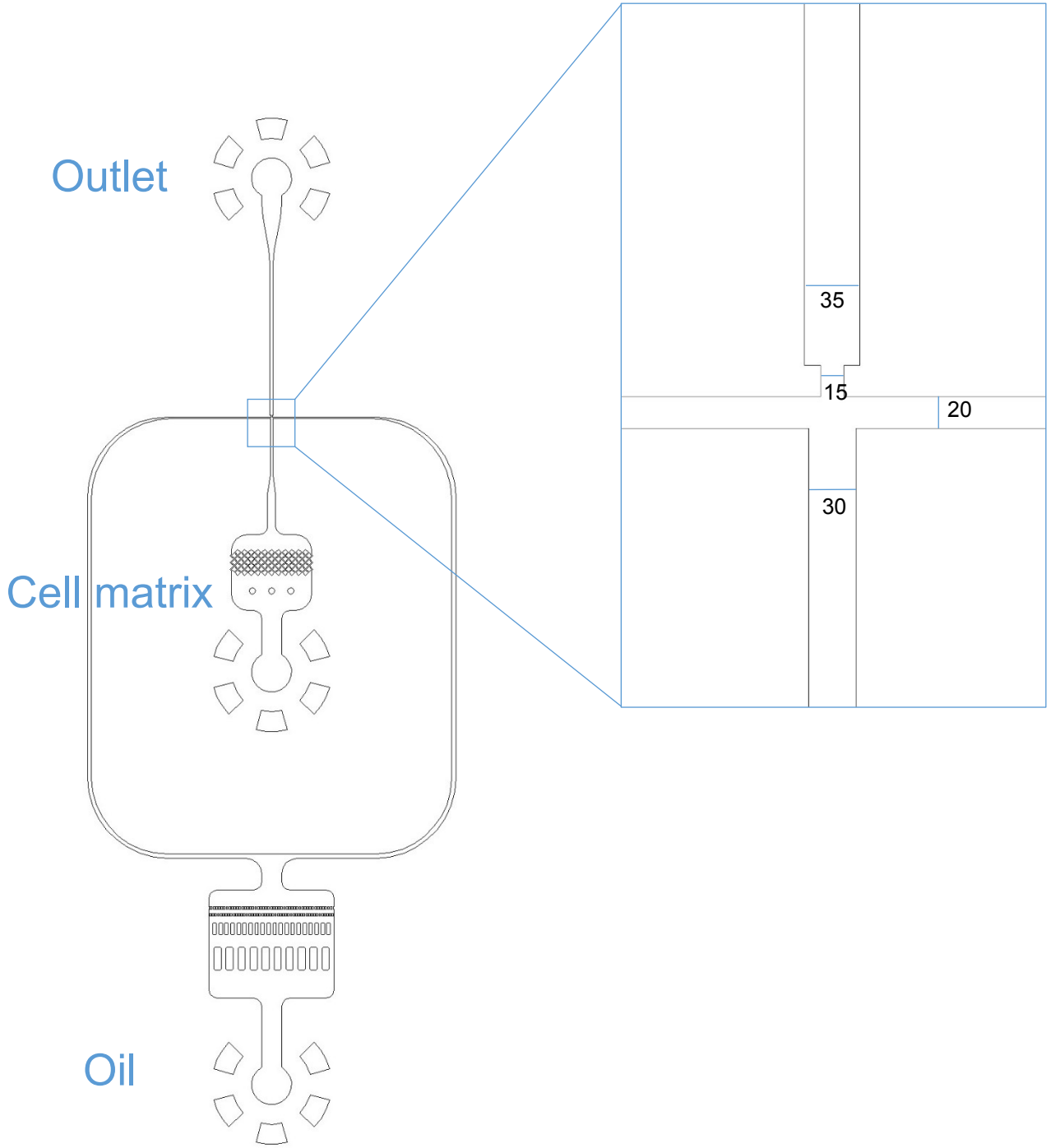
Homework

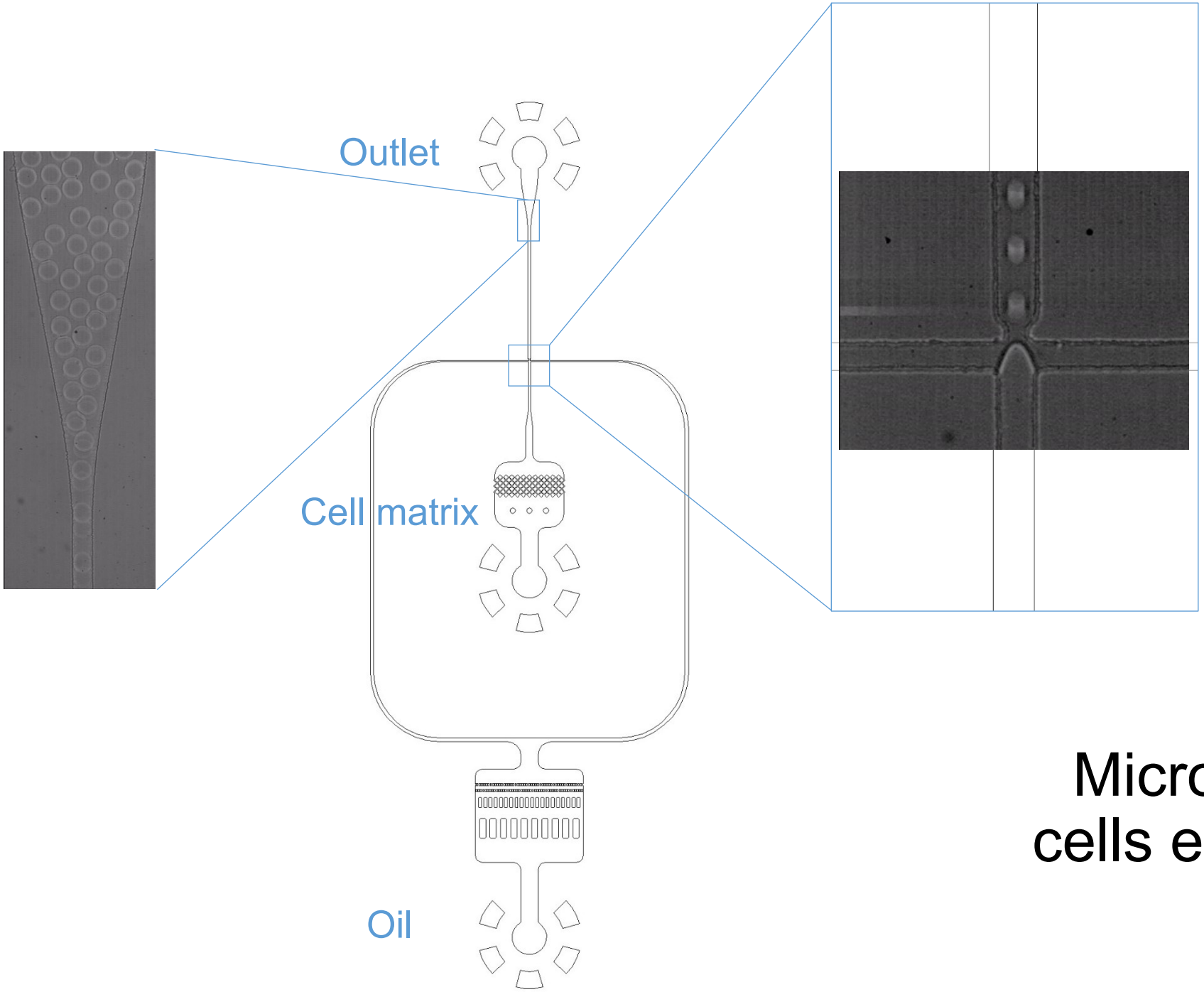
Droplet merging (homework)



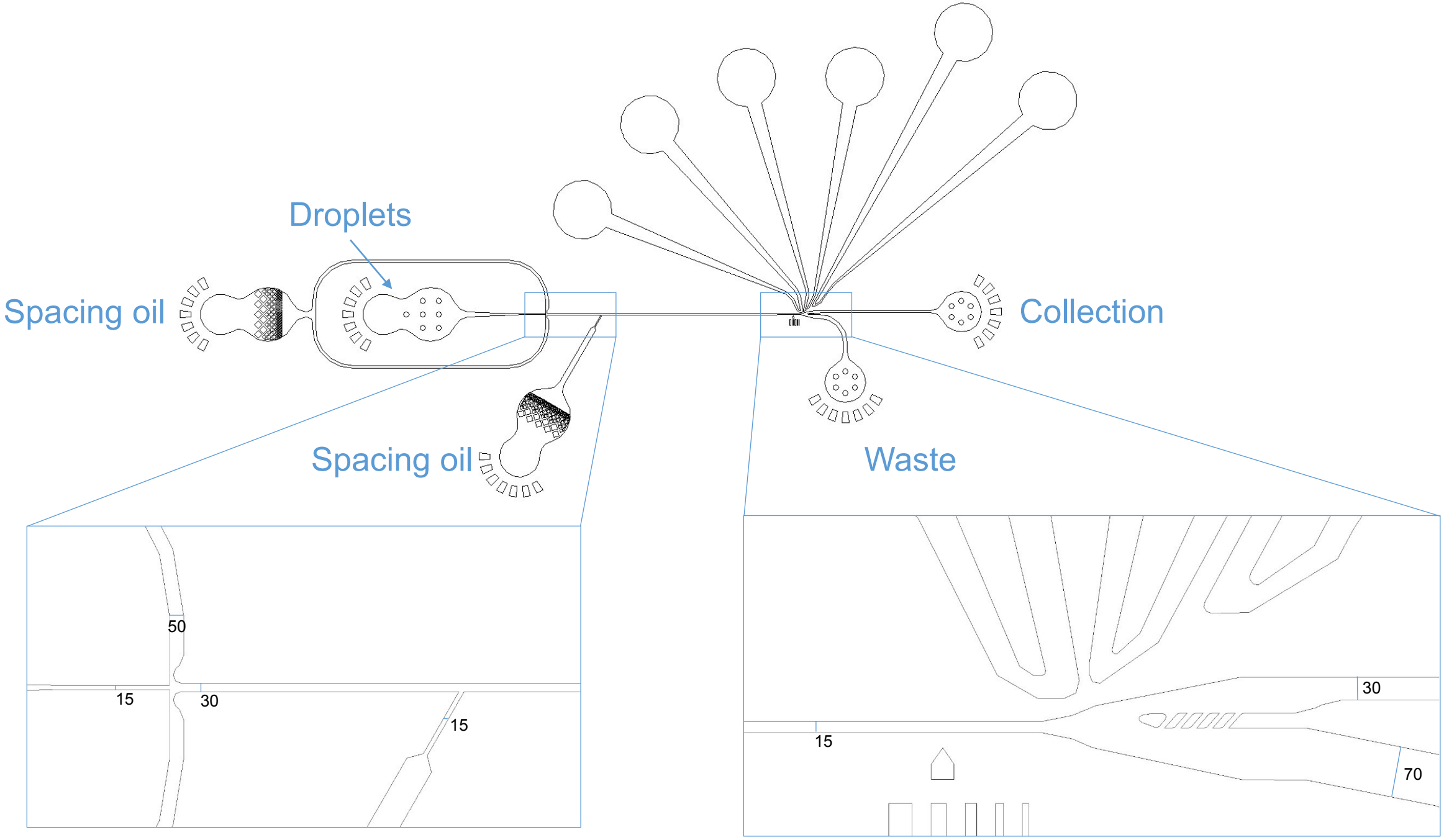


Inverted microscope / Olympus

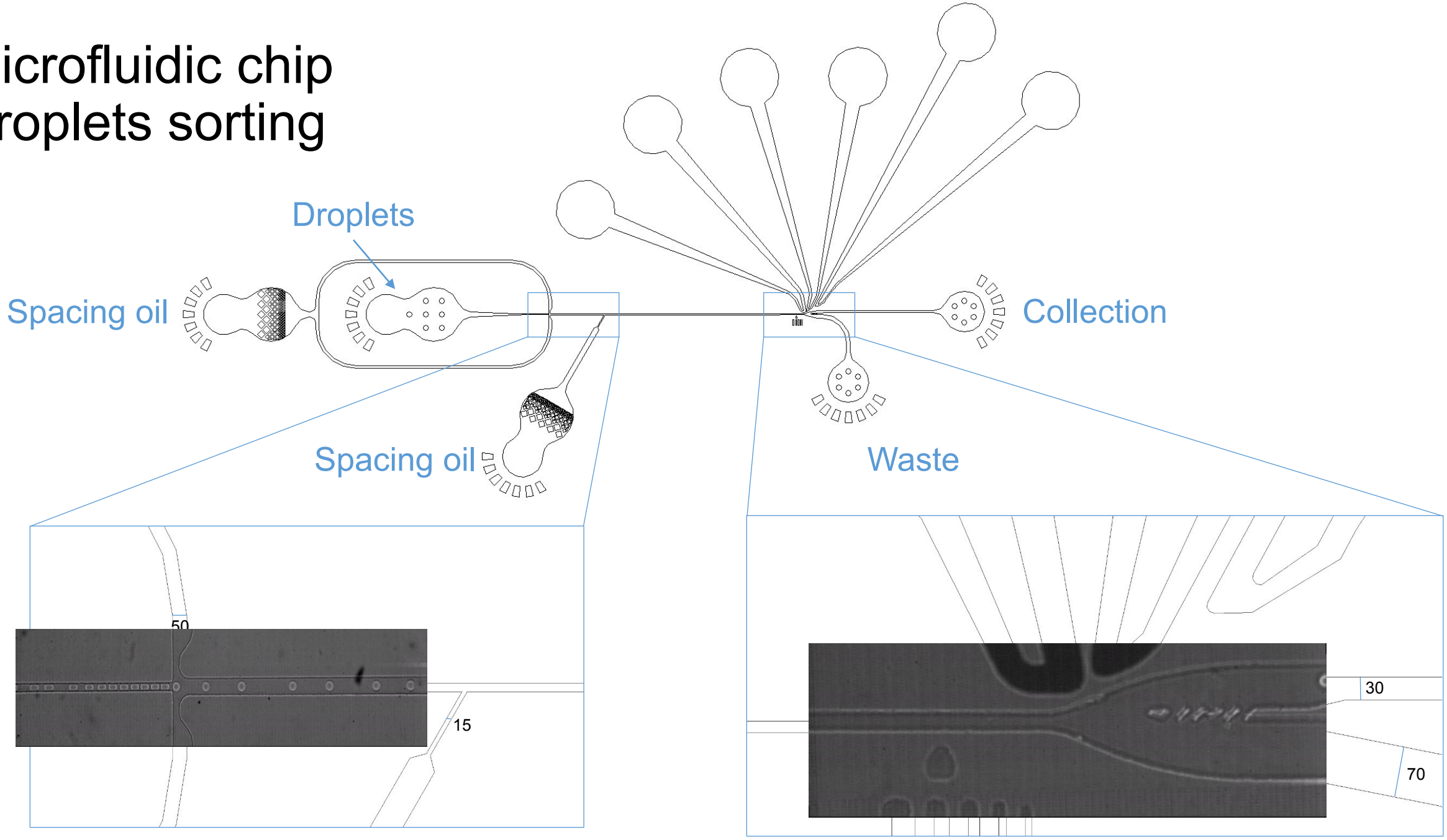

Outlet
Cell matrix
Oil
35
15
20
30



Microfluidic chip cells encapsulation


Droplets
Spacing oil
Collection
Spacing oil
Waste
50
15
30
15
30
15
70

Microfluidic chip droplets sorting



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

	Time needed for library 10^6 (10^8 colonies)	
	Plate based screening	**FADS**
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