Detection of Substances of Forensic Significance Using Microfluidics and SERS

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AIM photonics
AMERICAN INSTITUTE for MANUFACTURING INTEGRATED PHOTONICS

Our Research

Real world applications
Homeland security, medicine, drug
trafficking

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The devices
Inexpensive and reproducible

Our Research

Real world applications
Homeland security, medicine, drug trafficking

The devices
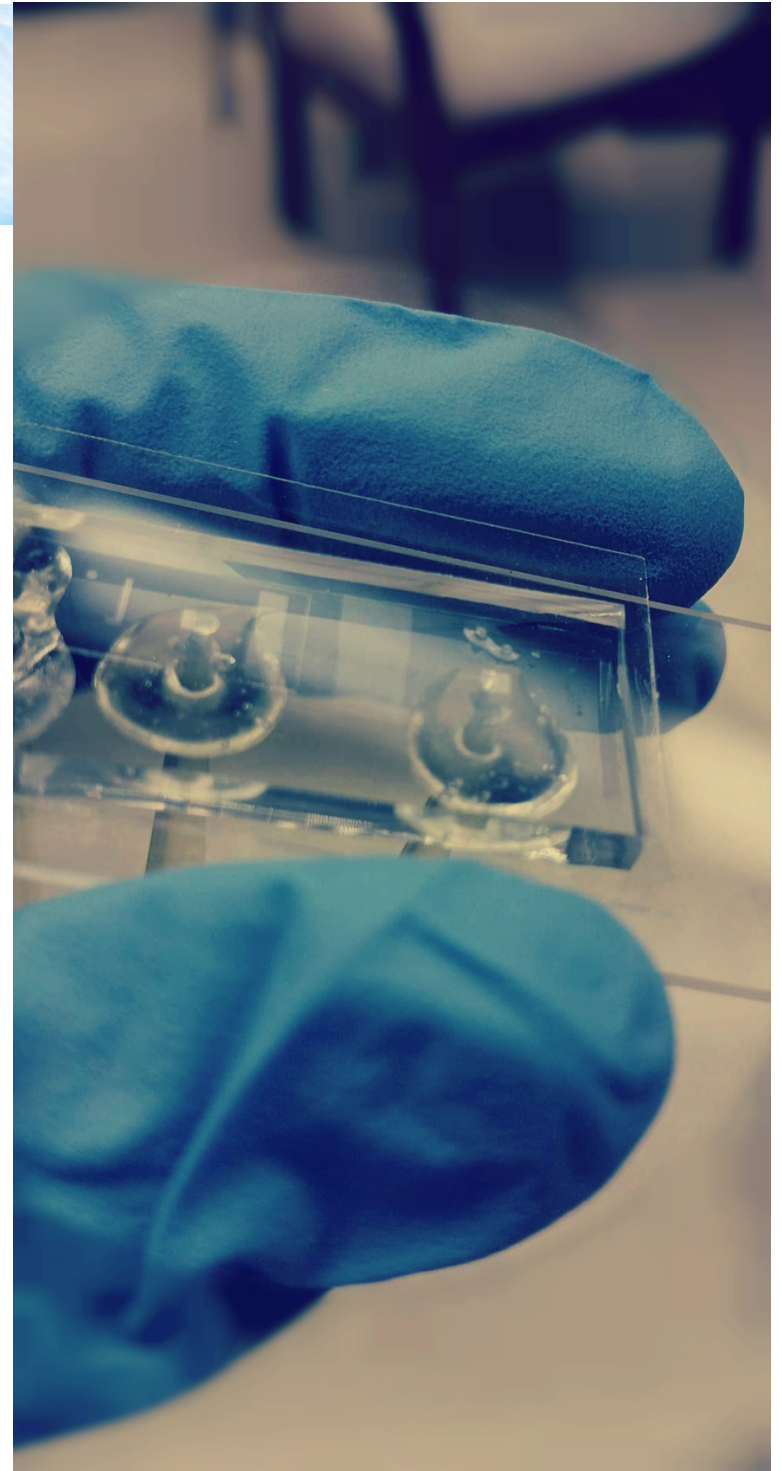Inexpensive and reproducible

Microfluidics
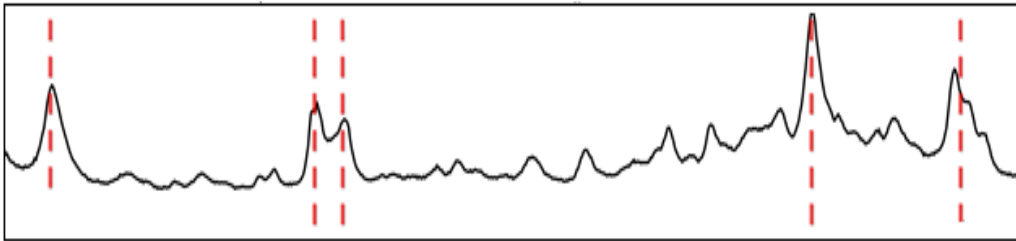Control small amounts of fluid in a predictable way

Surface-enhanced Raman spectroscopy (SERS)
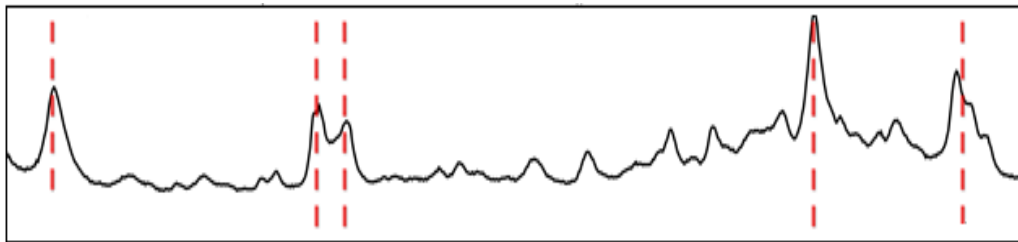Analyze composition, small sample volume

This Summer:

- Relate Raman spectra to concentration

Known concentration

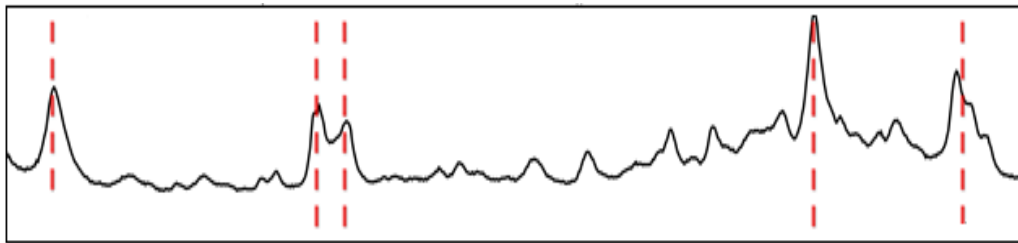# This Summer:

- Relate Raman spectra to concentration

Known concentration
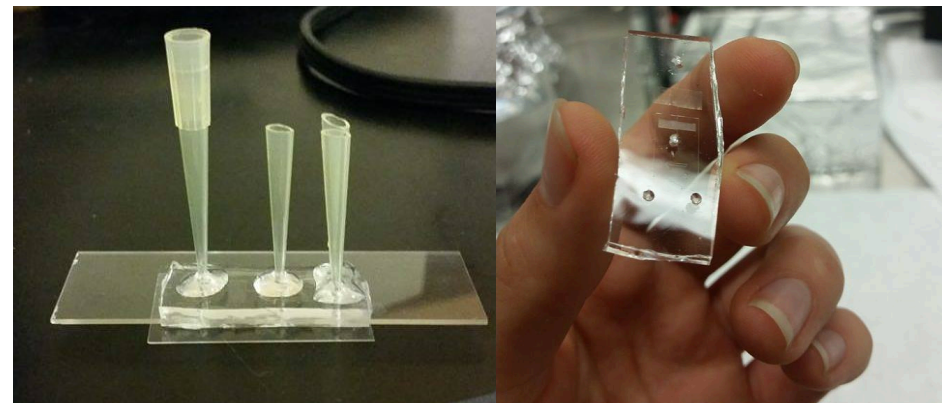
- Get Raman spectra for different concentrations

This Summer

- Relate Raman spectra to concentration

Known concentration

- Get Raman spectra for different concentrations
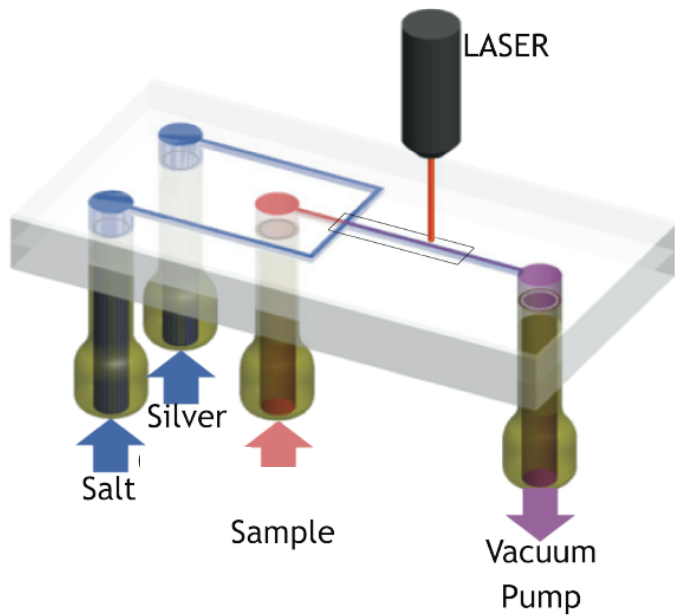
- Build devices

Data Collection

Sample preparation

1

2

3

Data Collection

Sample preparation

- 0.1-100 µM sample
- Flow salt (LiCl)
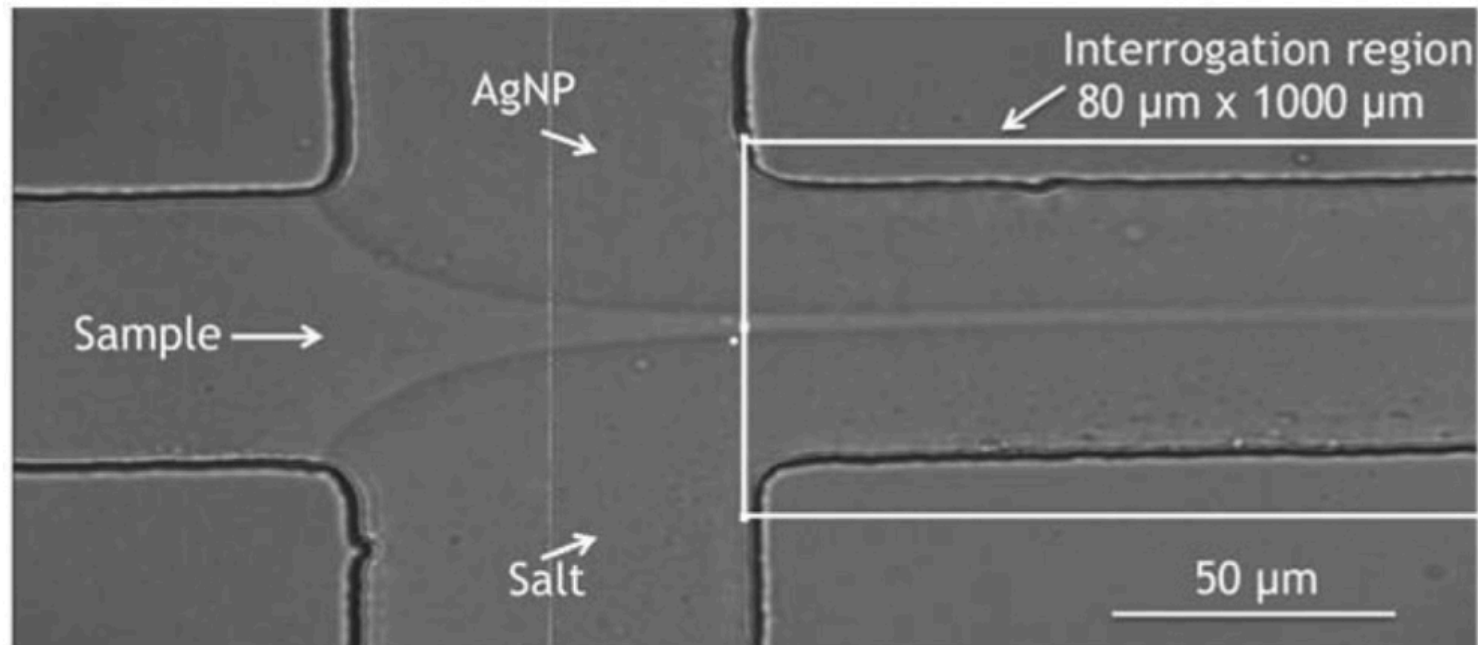- 20 nm AgNPs

Data Collection

Microscope & fluidic processes
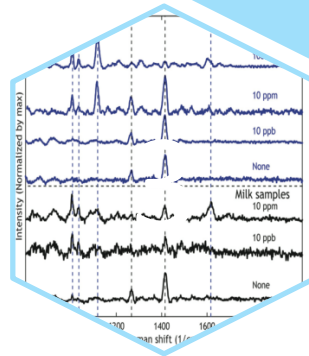
1

2

3

Data Collection

- Low velocity creates separated flow
- Mixture of fluids purely driven by diffusion
- Salt induces aggregation of silver necessary for strong signal
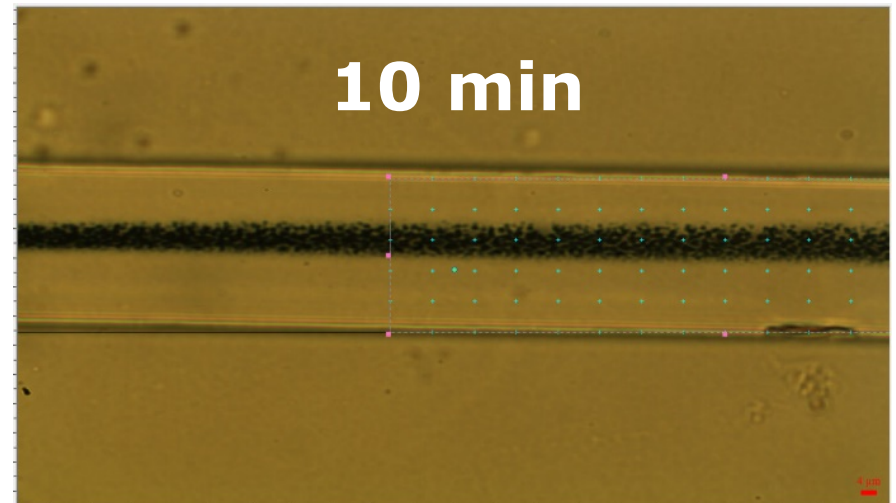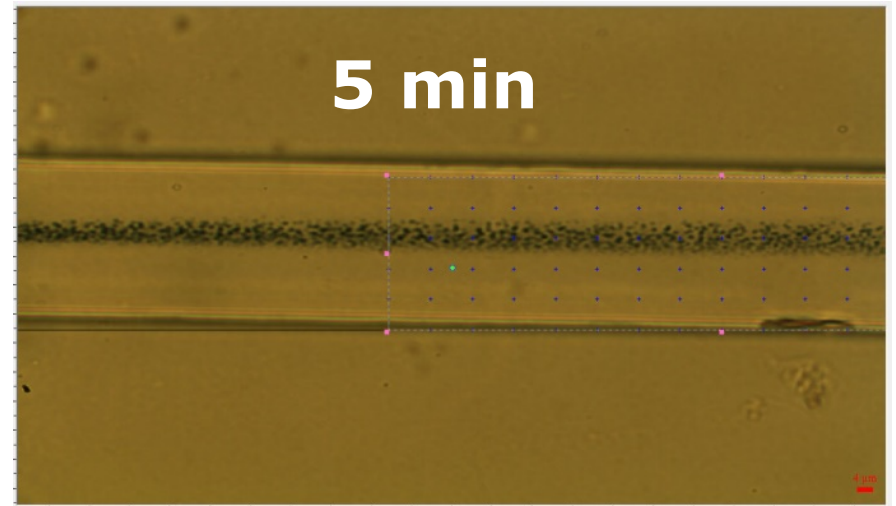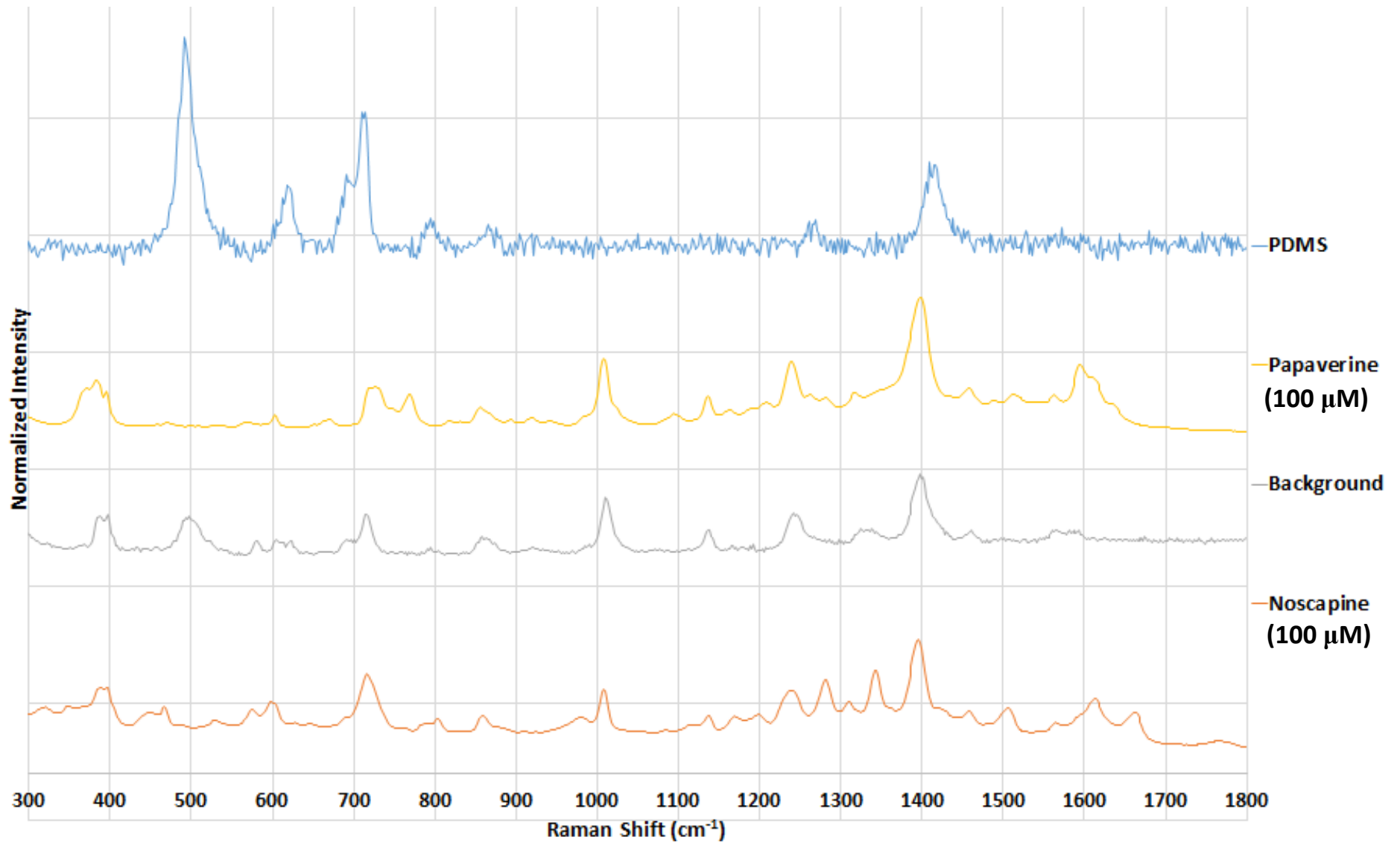
Data Collection

1

2

Laser and SERS

Data Collection

- Map channel section with 633 nm laser
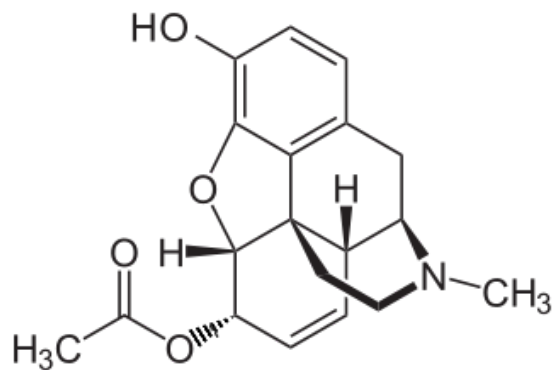
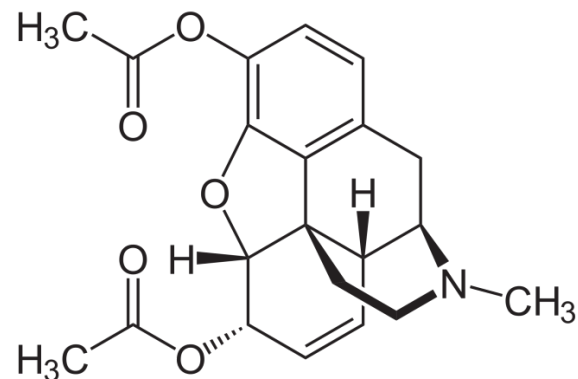- Run device 4-5 times

- Stop after 10-12 minutes

5 min

10 min
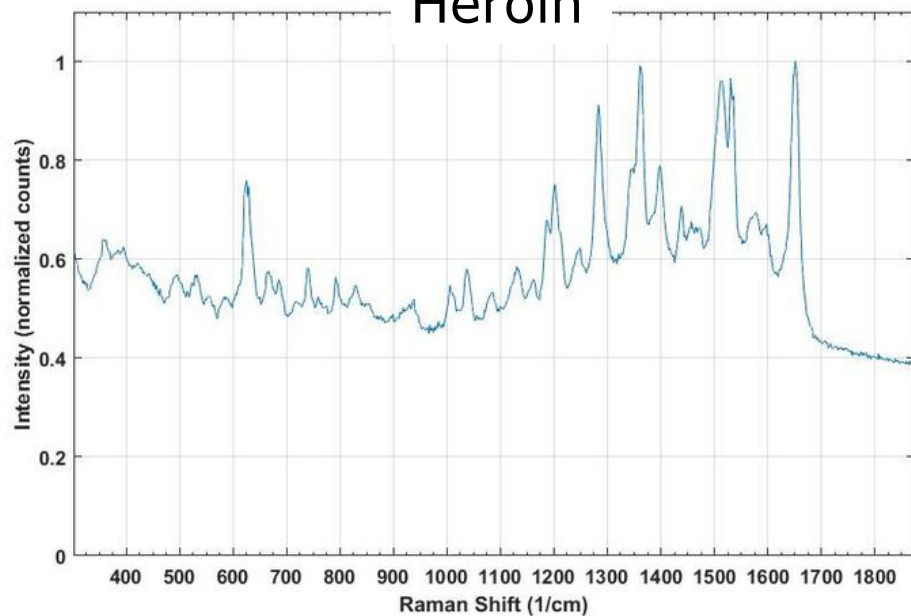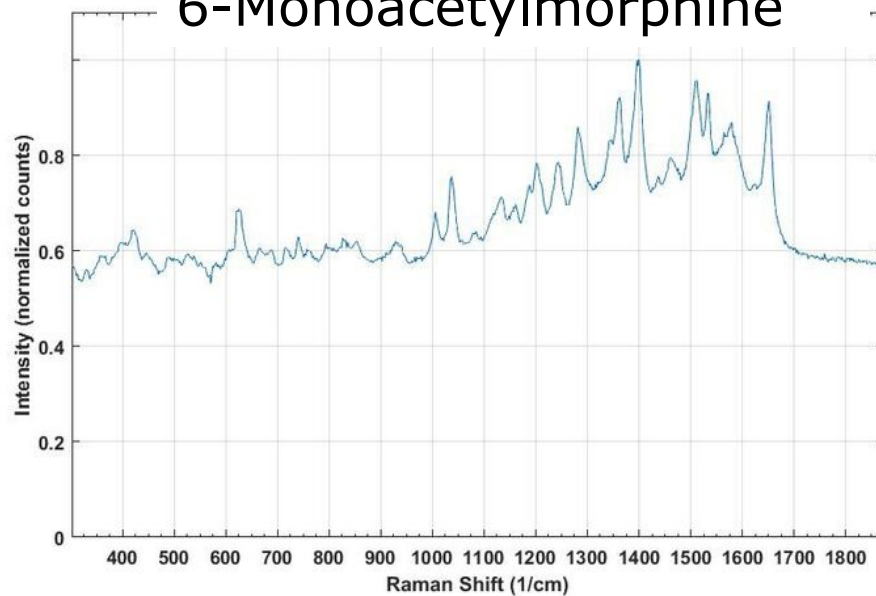
Data – Noscapine/Papaverine

Data – References

Heroin

6-Monoacetylmorphine

Progress to date

Lab work
Microfluidic devices, Raman microscope

Papaverine and noscapine
Gathered data for 100uM

Reference spectra
Heroin, morphine, 6-MAM

Future work

➤ Test broader range of concentrations

➤ Obtain data for other substances

➤ Spectra-concentration relationship

Acknowledgments

Thank You!