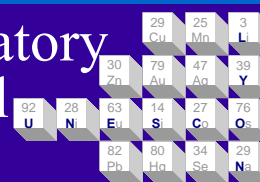


Capillary Electrophoresis Microchips with Amperometric Detection for Separation of Nitrophenolic Pollutants

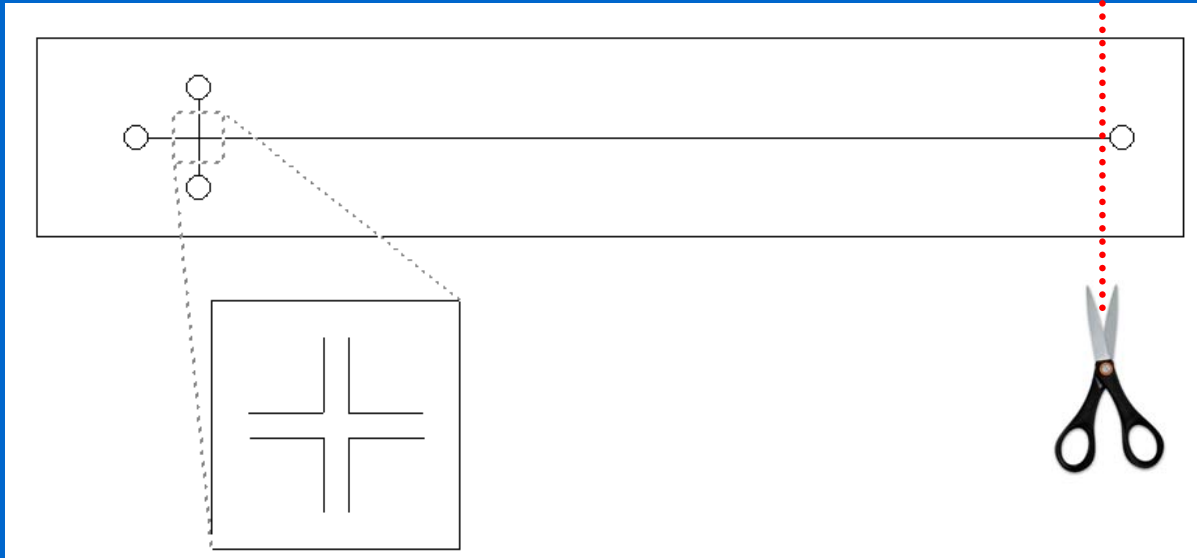


Jan Fischer

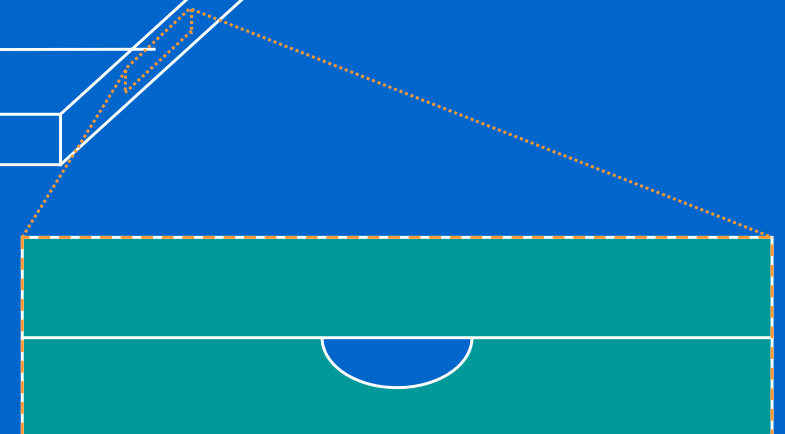
UNESCO Laboratory
of Environmental
Electrochemistry

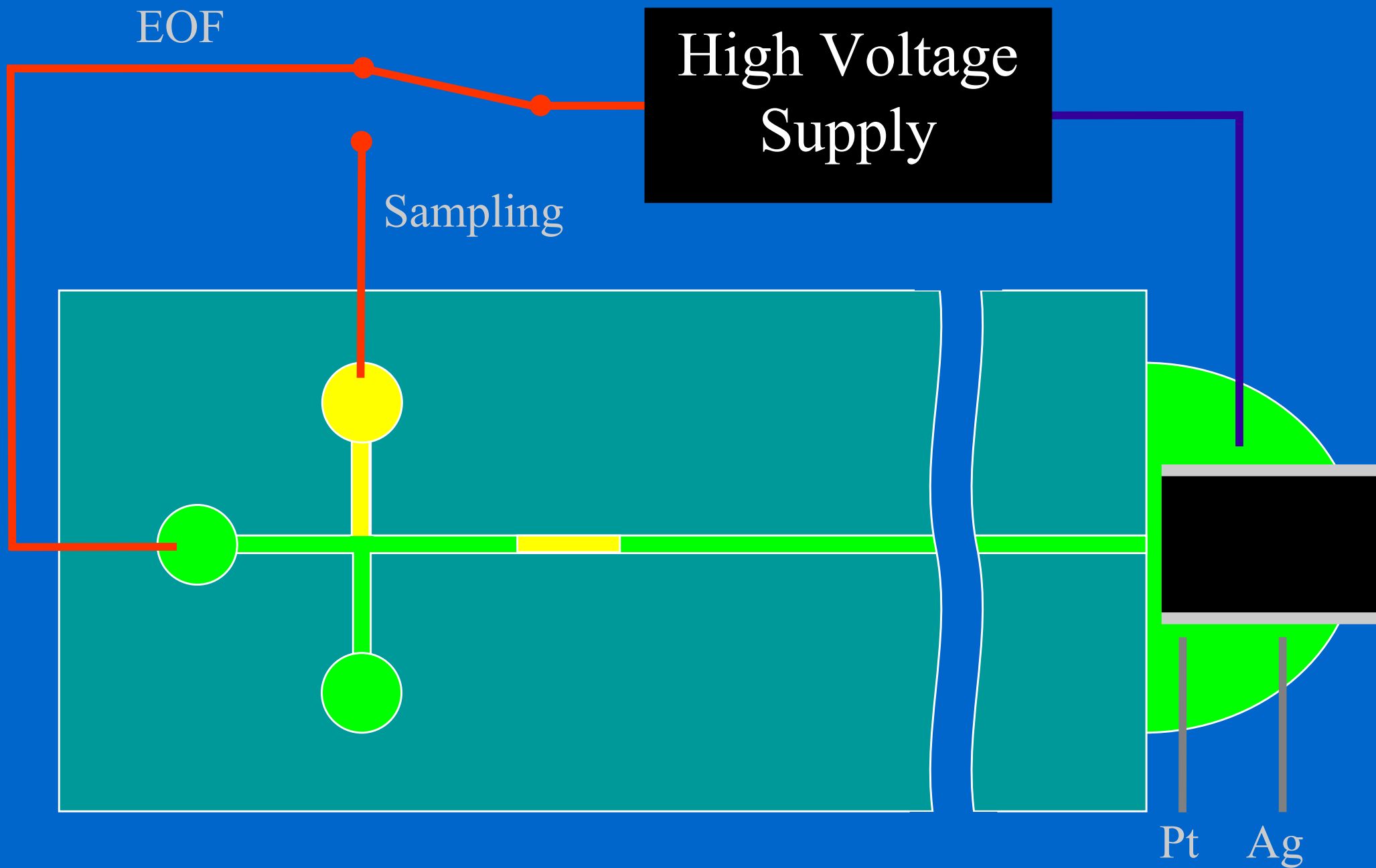


Microchip

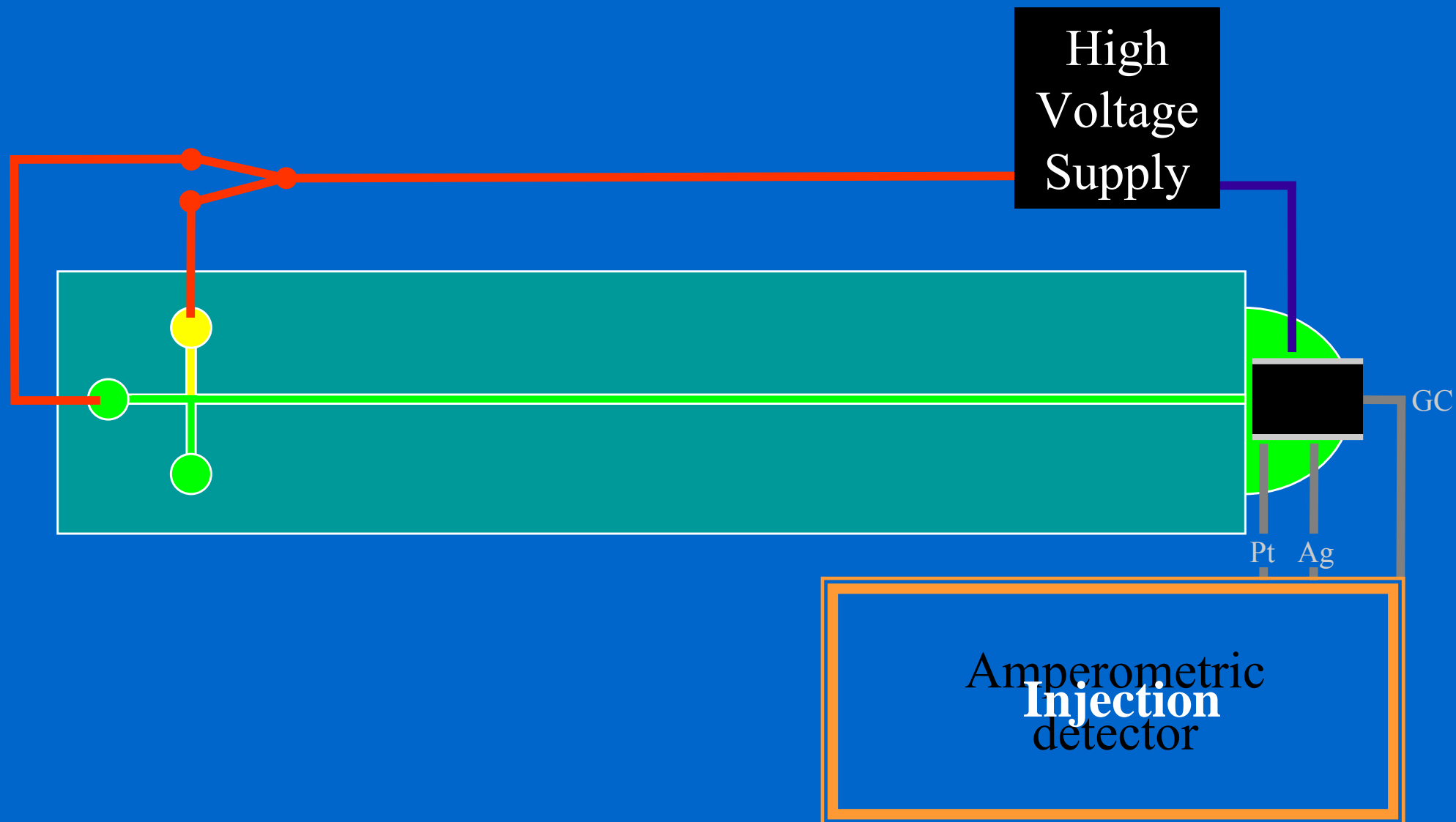


- Cutting
- Activation
- Keeping
- Clearing



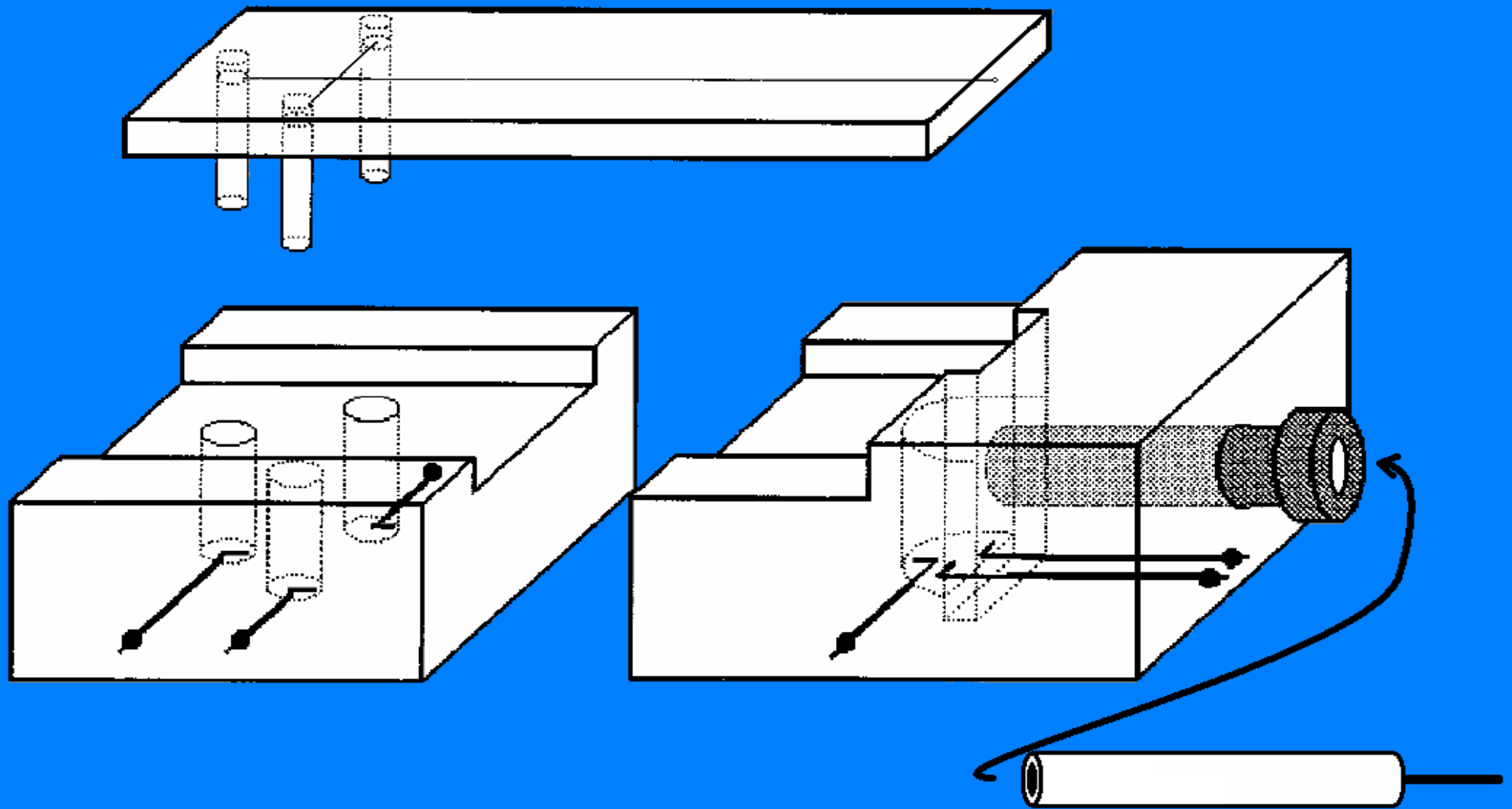


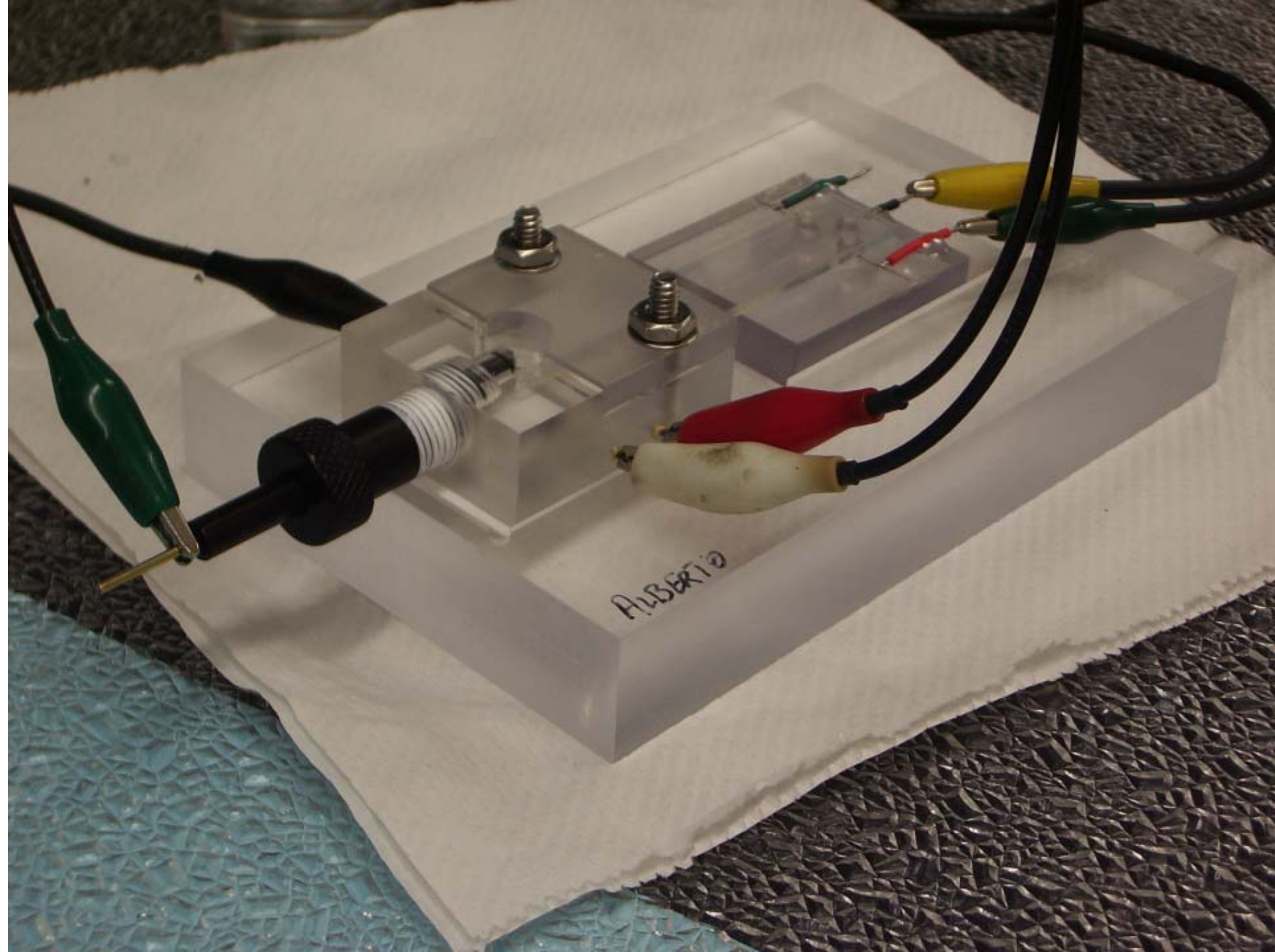
Microchip Analysis





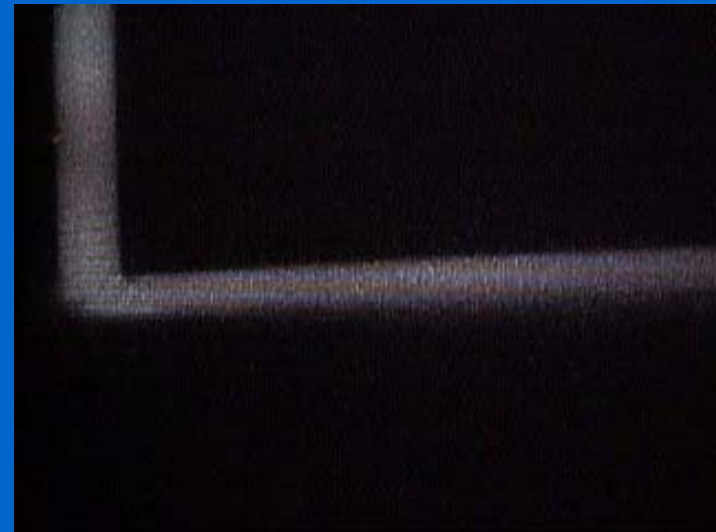
Arrangement





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-

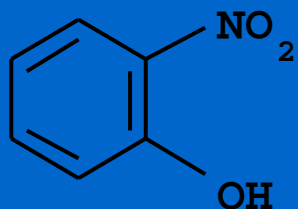
Problem of Flow and Impurities



Fluorescence due

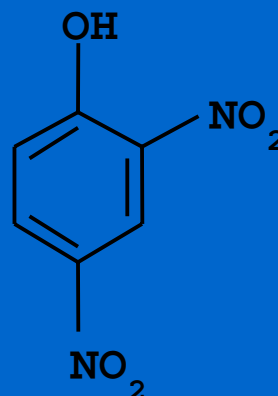
Ni-nanowire

Nitrophenols



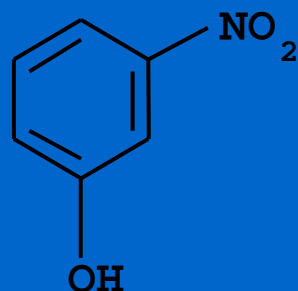
2-nitrophenol

2NP



2,4-dinitrophenol

DNP



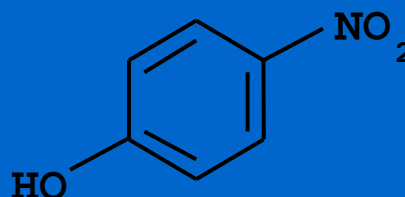
3-nitrophenol

3NP



2-methyl-4,6-dinitrophenol

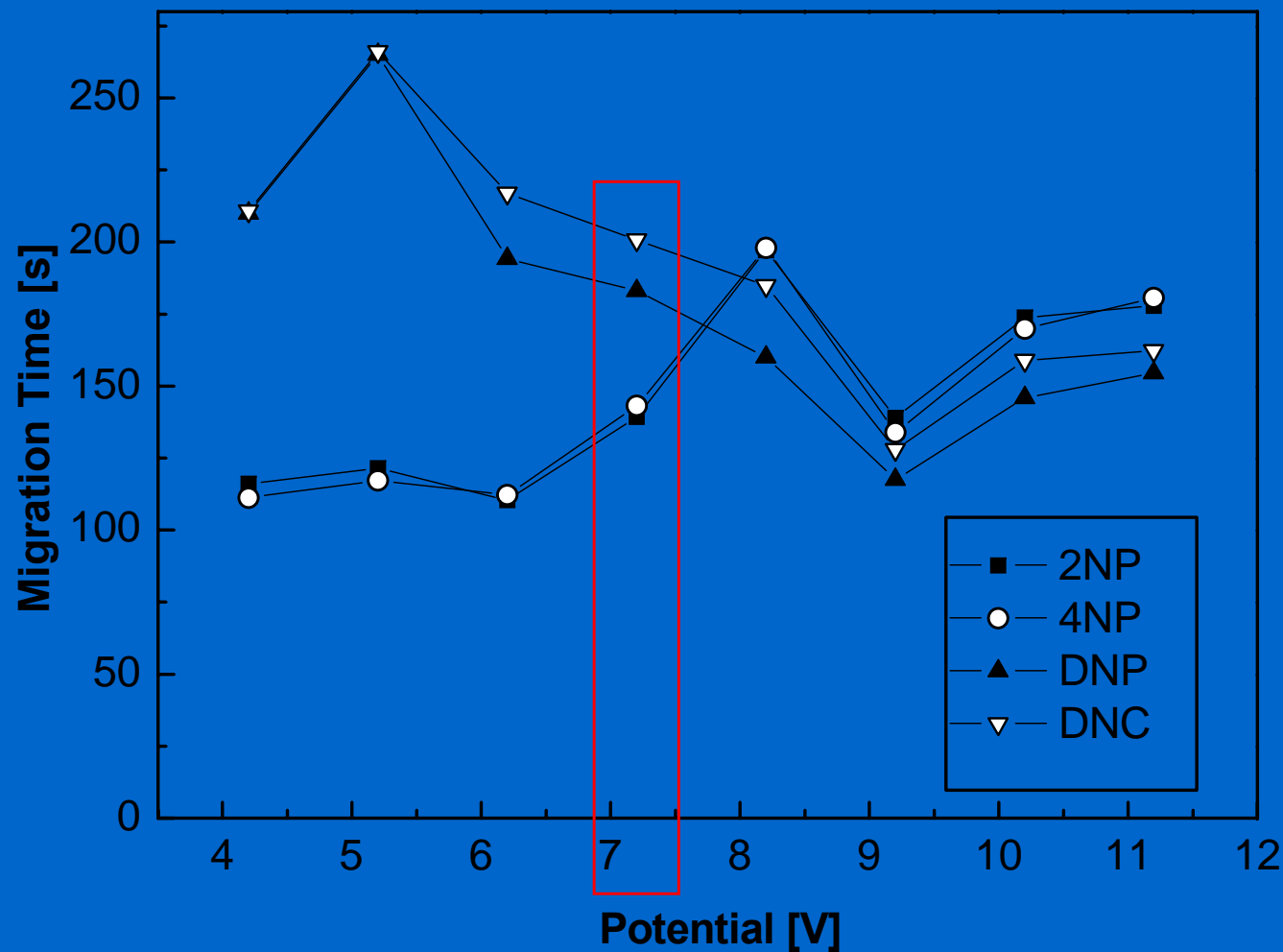
DNC



4-nitrophenol

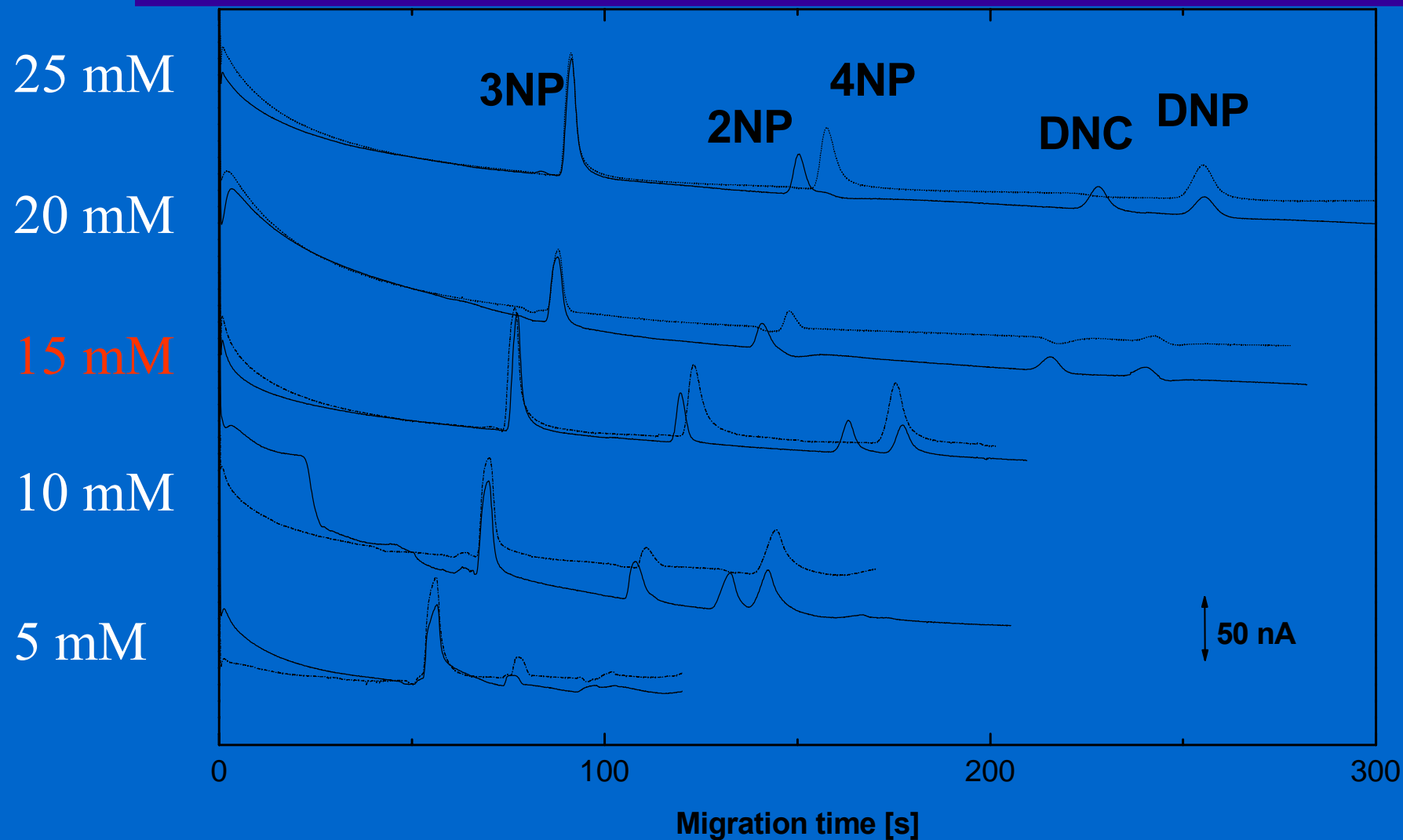
4NP

Effect of pH



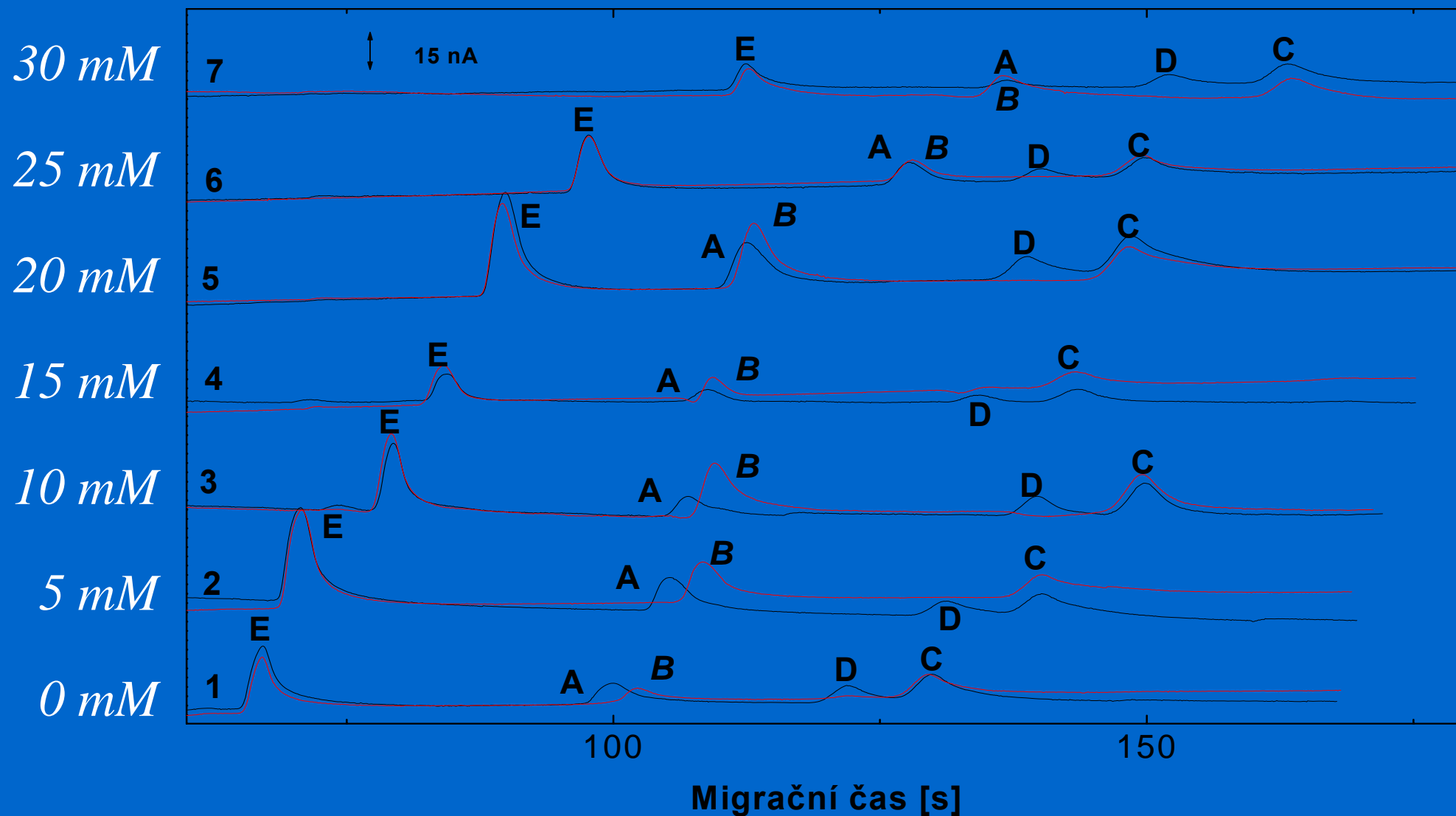
15 mM buffer adjusted to given pH (acetate for pH 4.2 and 5.2; phosphate for pH 6.2, 7.2, 8.2 and 11.2; borate for pH 9.2 and 10.2), 2 kV separation voltage

Concentration of Buffer



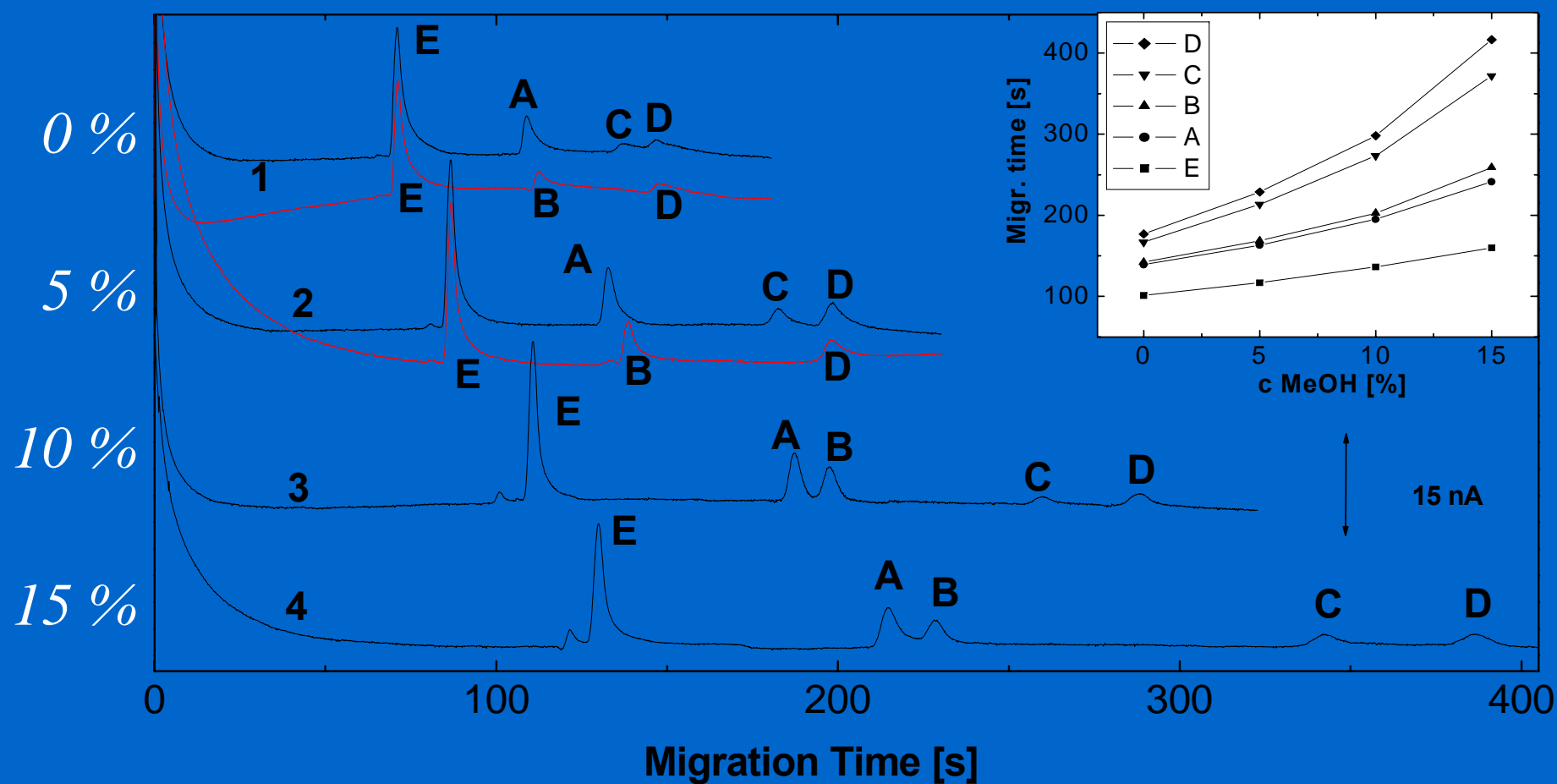
5 – 25 mM phosphate buffer pH 7.2, 2 kV separation voltage, 1 s sampling

Effect of SDS



2NP...(A), 4NF...(B), MDNF...(C), DNF...(D), 3NF...(E)

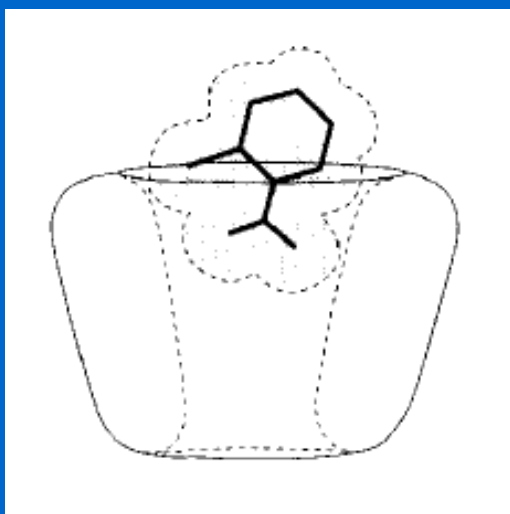
Effect of Methanol



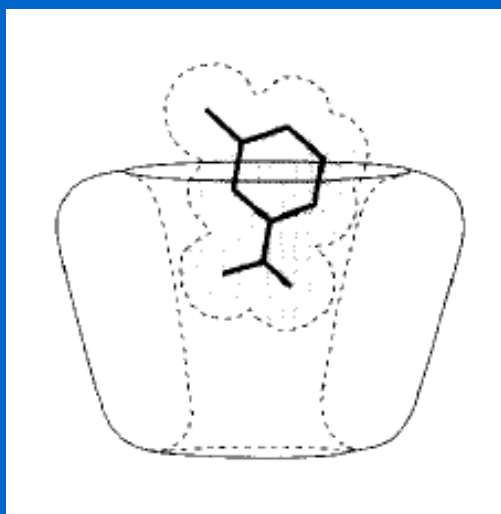
2NP...(A), 4NF...(B), MDNF...(C), DNF...(D), 3NF...(E)

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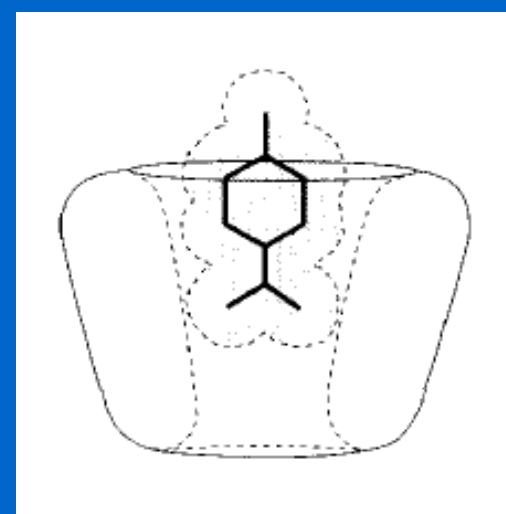
α -Cyclodextrin



2NP



3NP

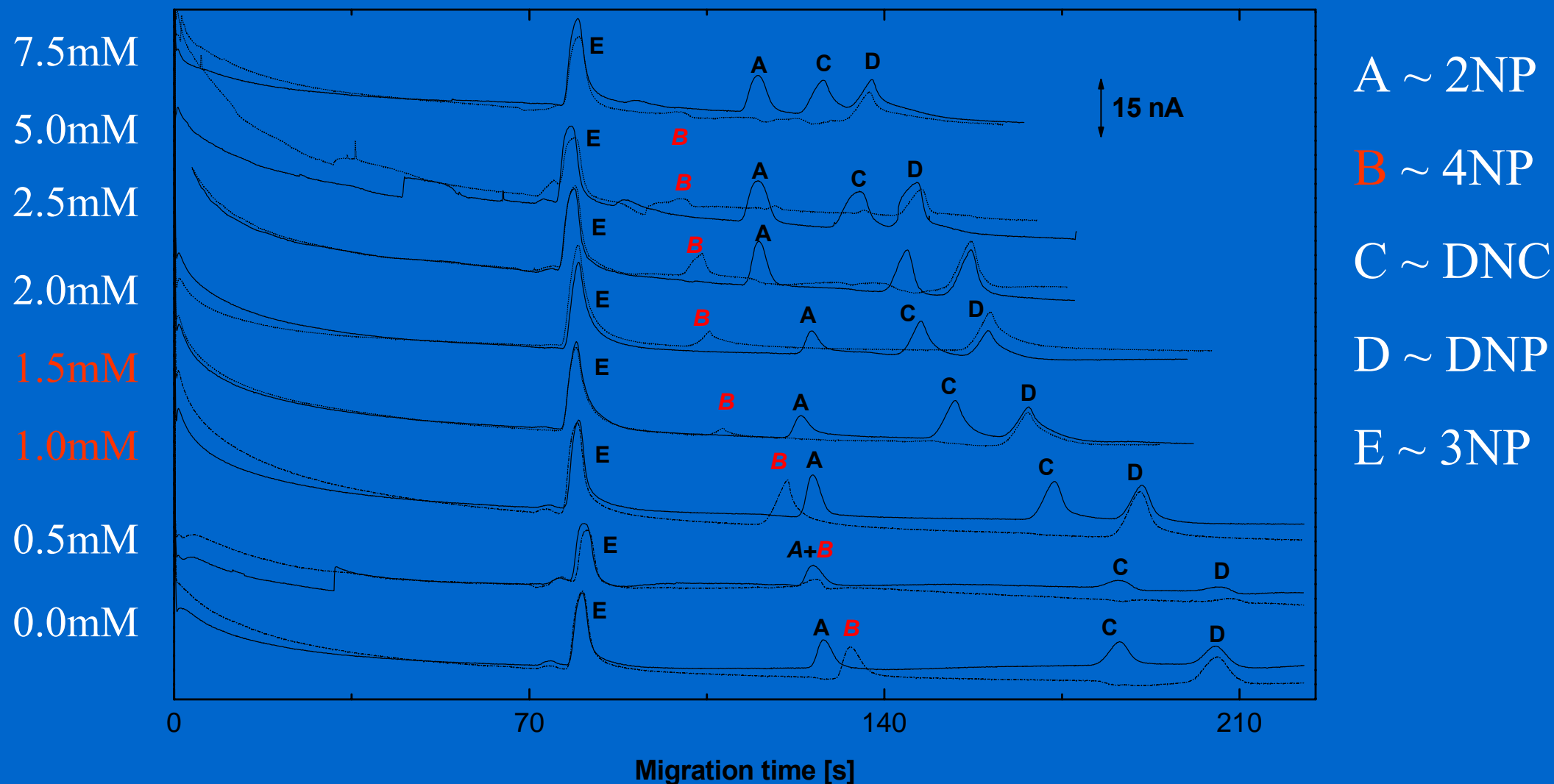


4NP

Computer generated representations of the inclusion complexes, based on indices determined by X-ray crystallography.

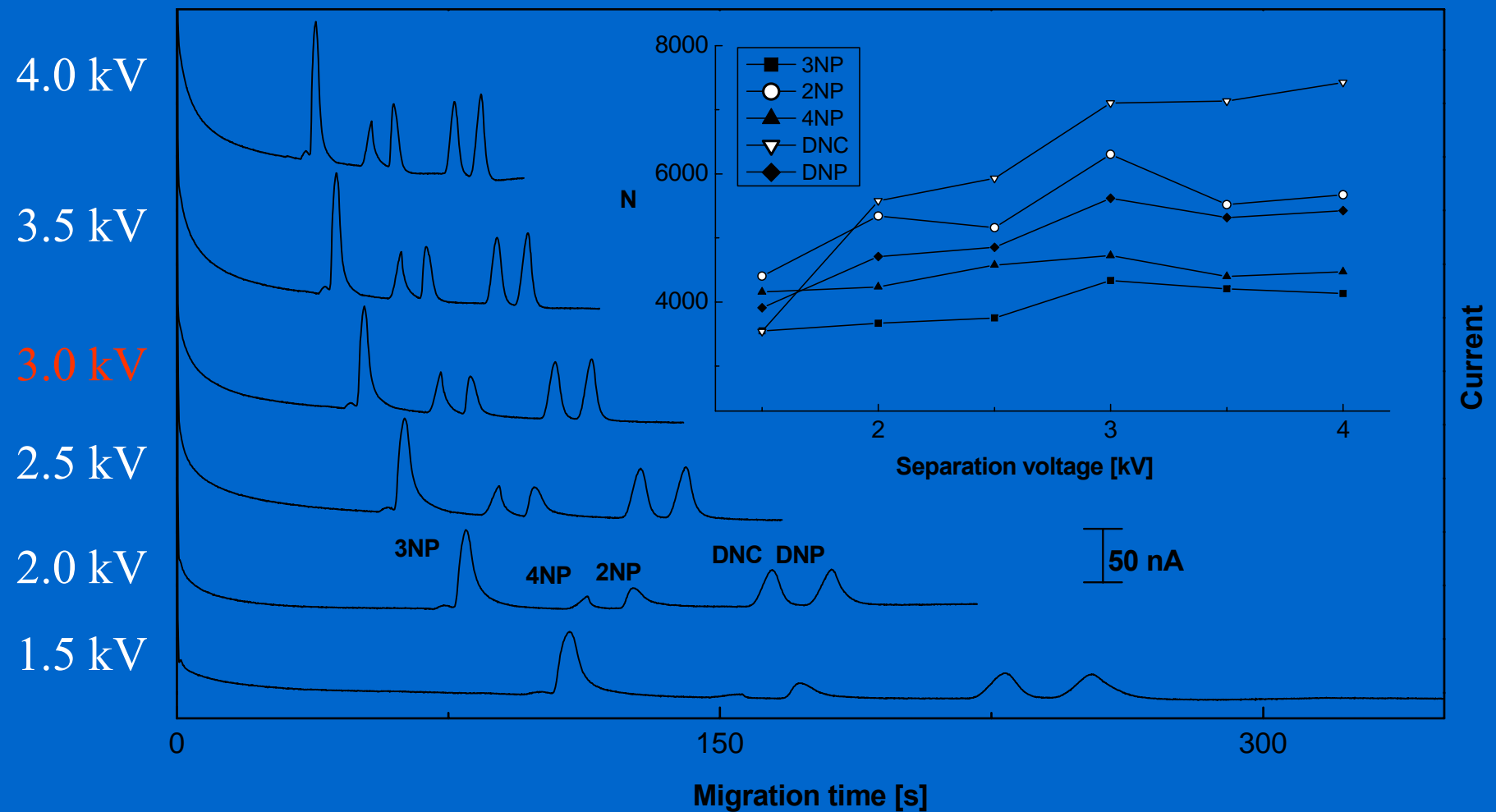
C.A. Lucy et al. / J. Chromatogr. A 745 (1996) 9-15

Effect of α -Cyclodextrin



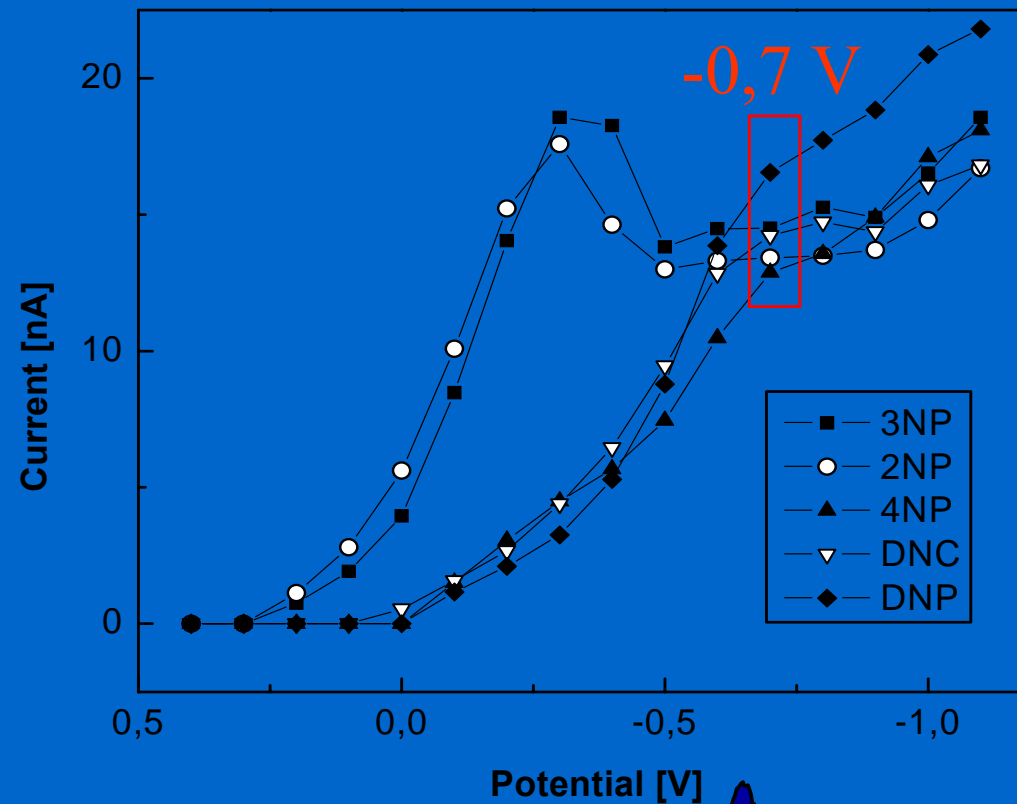
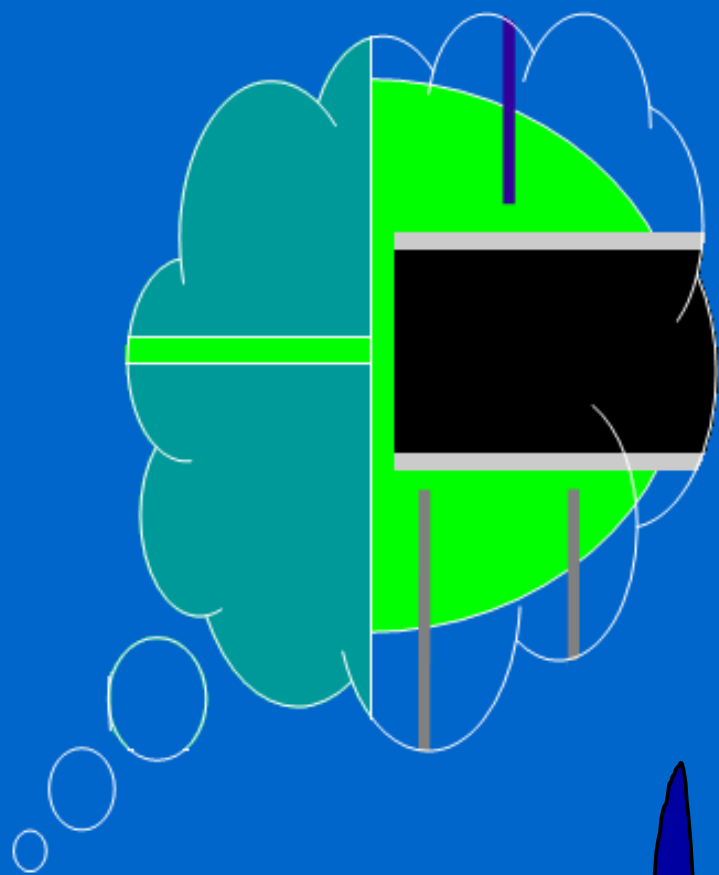
15 mM phosphate buffer pH 7.2 with given concentration of α -CD, 2 kV separation voltage

Separation Voltage

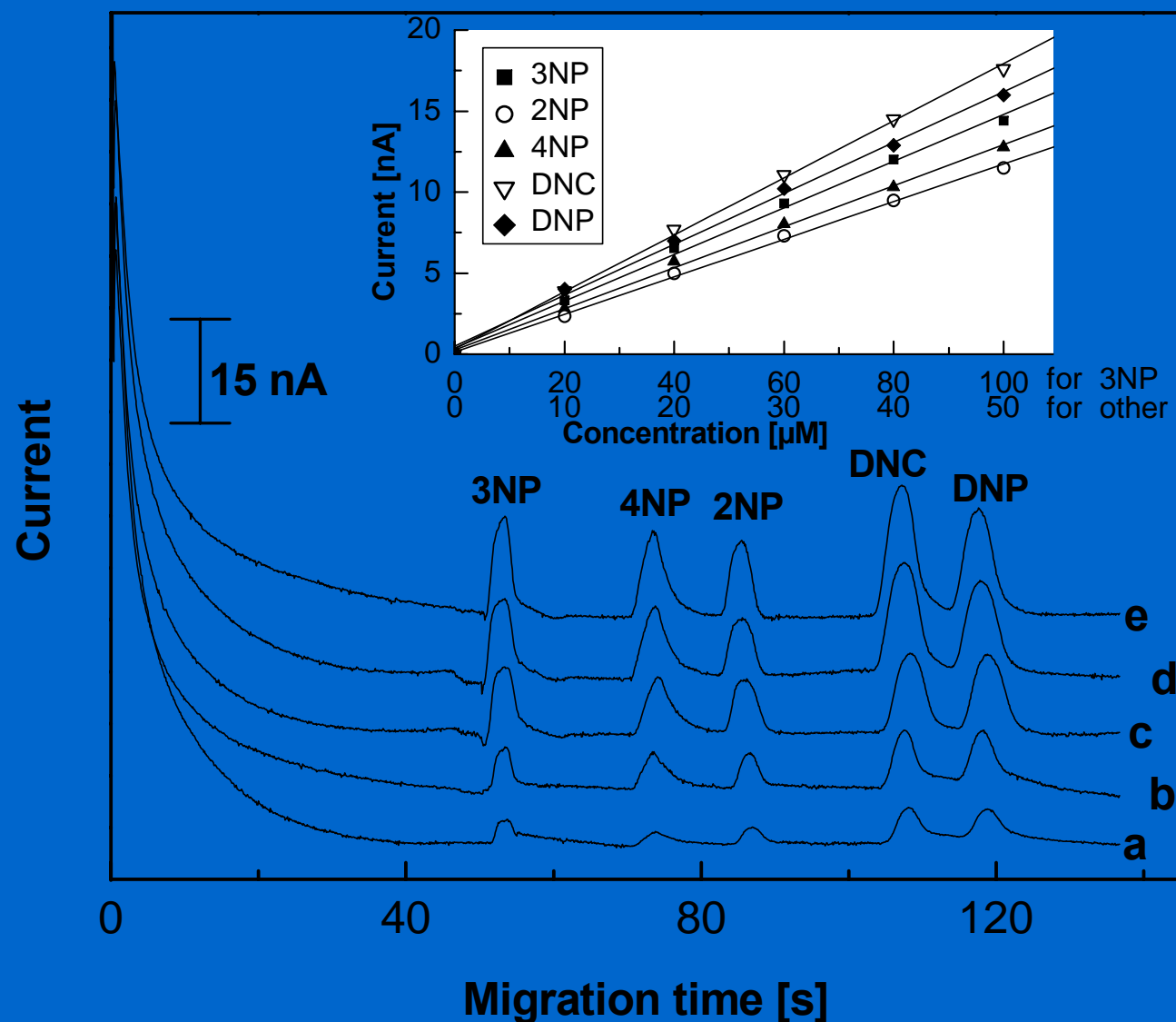


15 mM phosphate buffer pH 7.2, 1.3mM α -CD, 2 kV and 3s for injection

Detection potential



Calibration Dependence



Limit of detection
S/N=3

3NP ... 35 μmol/L

4NP ... 39 μmol/L

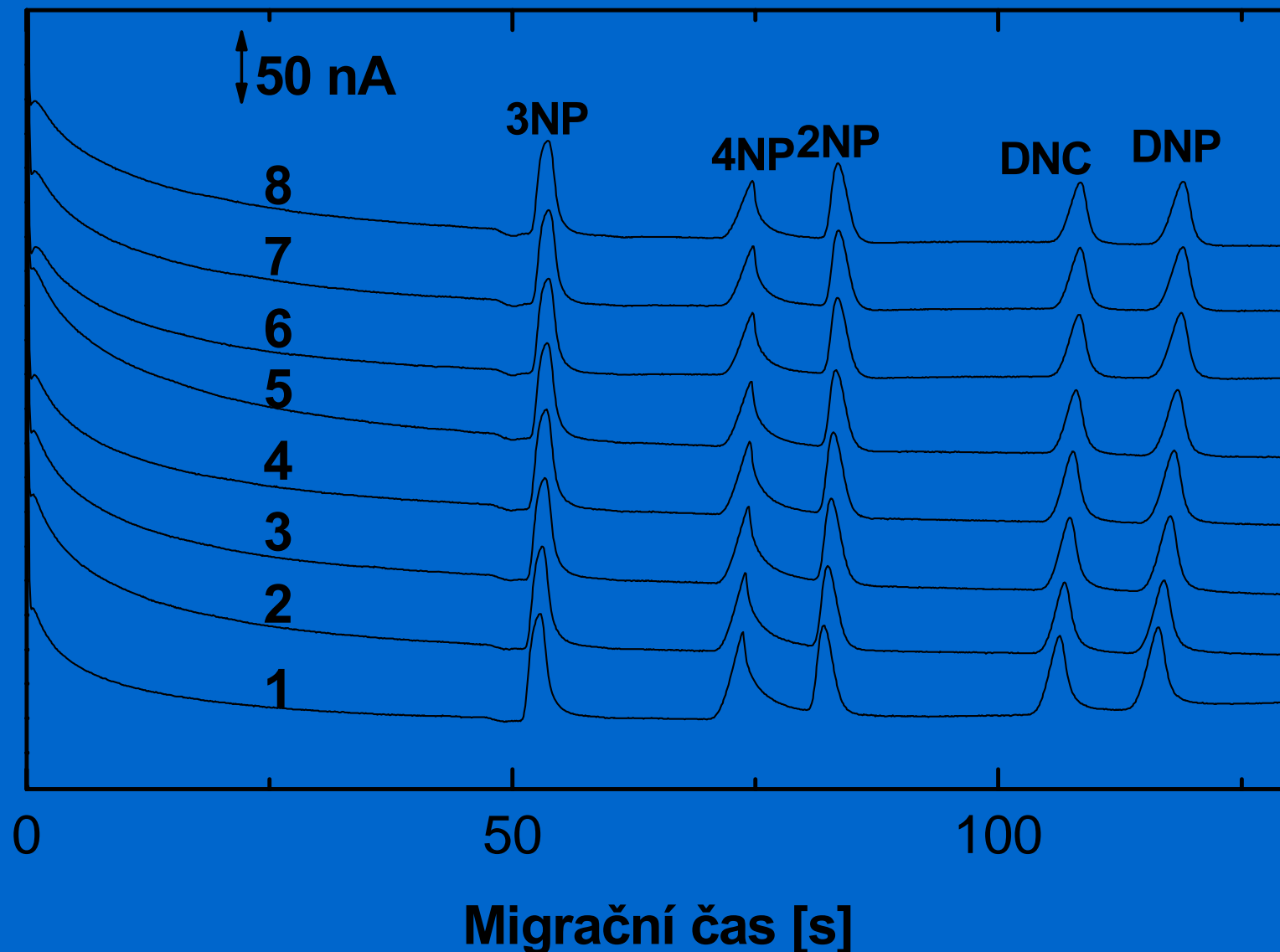
2NP ... 43 μmol/L

DNC ... 28 μmol/L

DNP ... 32 μmol/L

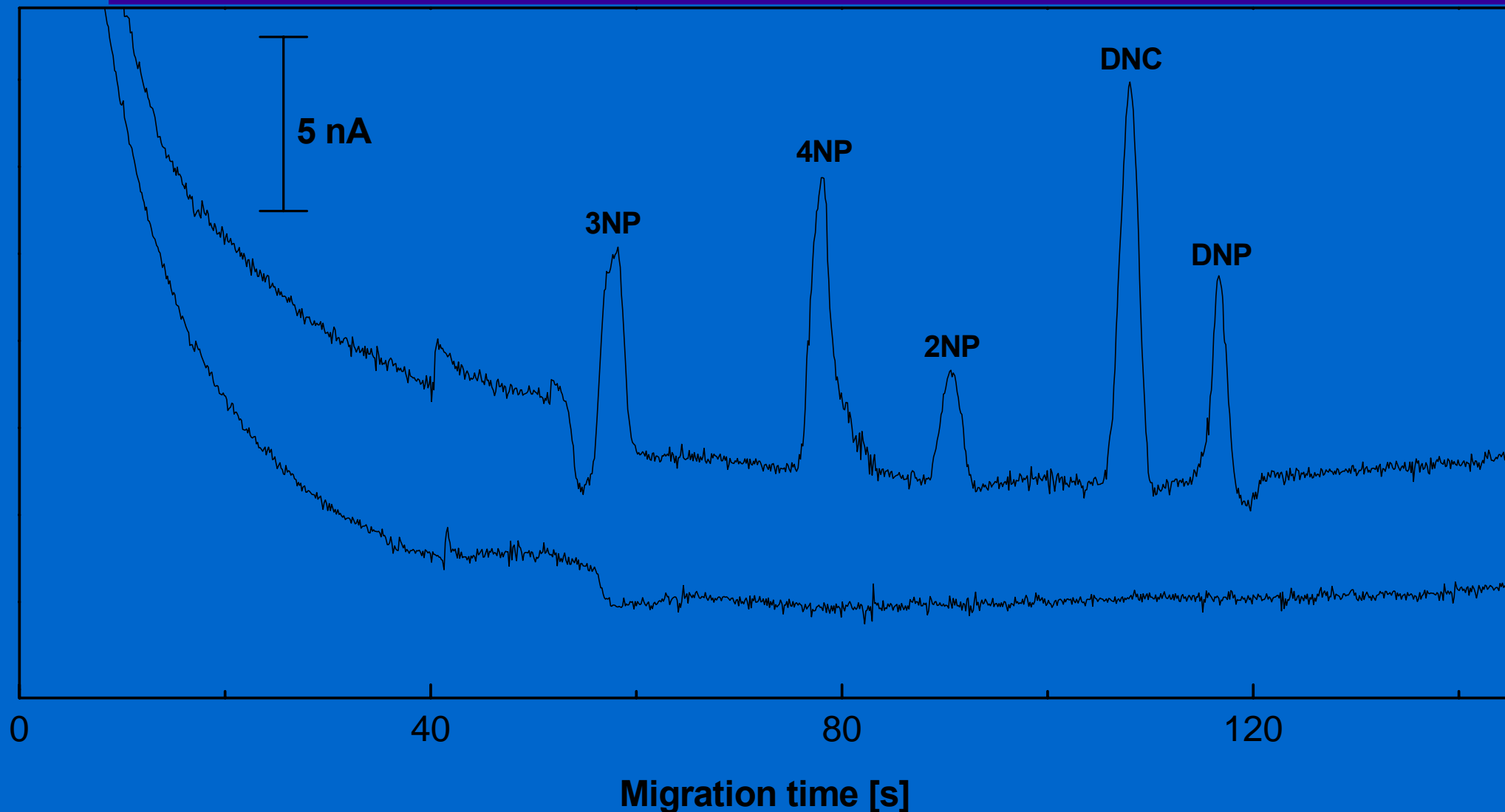
15mM phosphate buffer pH 7.2, 1.3mM α-CD, 3 kV for separation, 2 kV and 3s for injection

Repeatability of Measurements



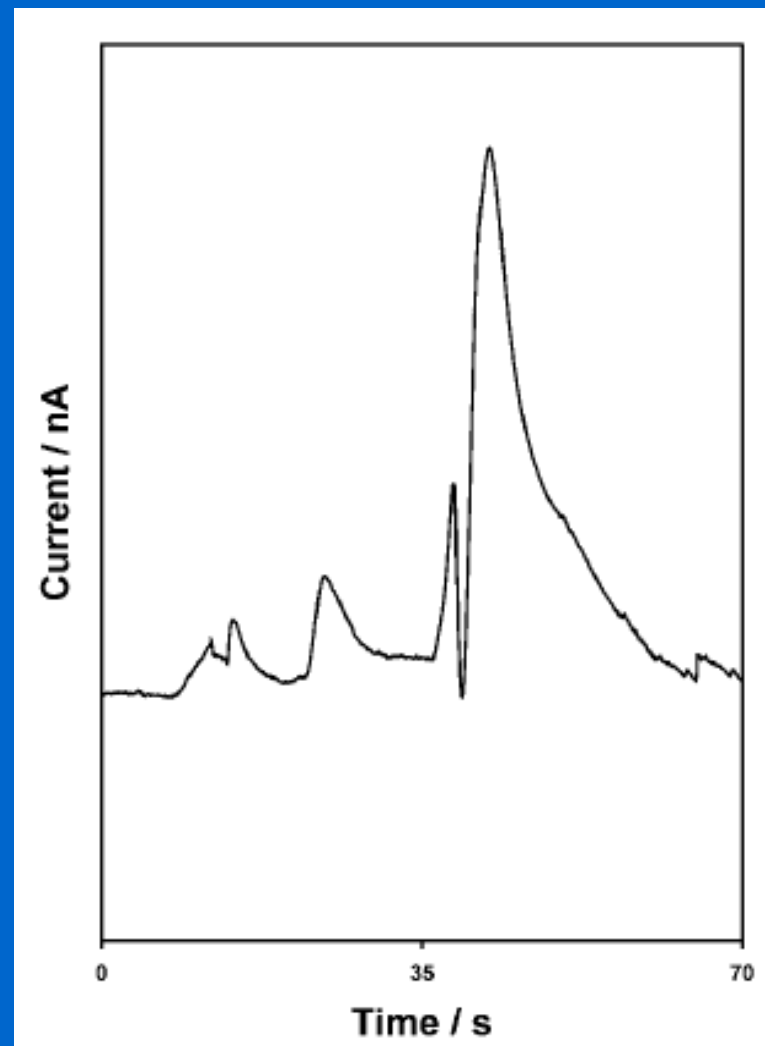
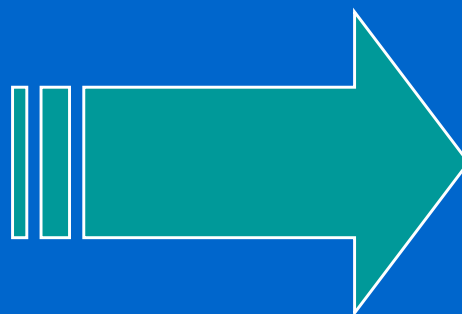
15mM phosphate buffer pH 7.2, 1.3mM α -CD, 3 kV for separation, 2 kV and 3s for injection

Determination in Ground Water



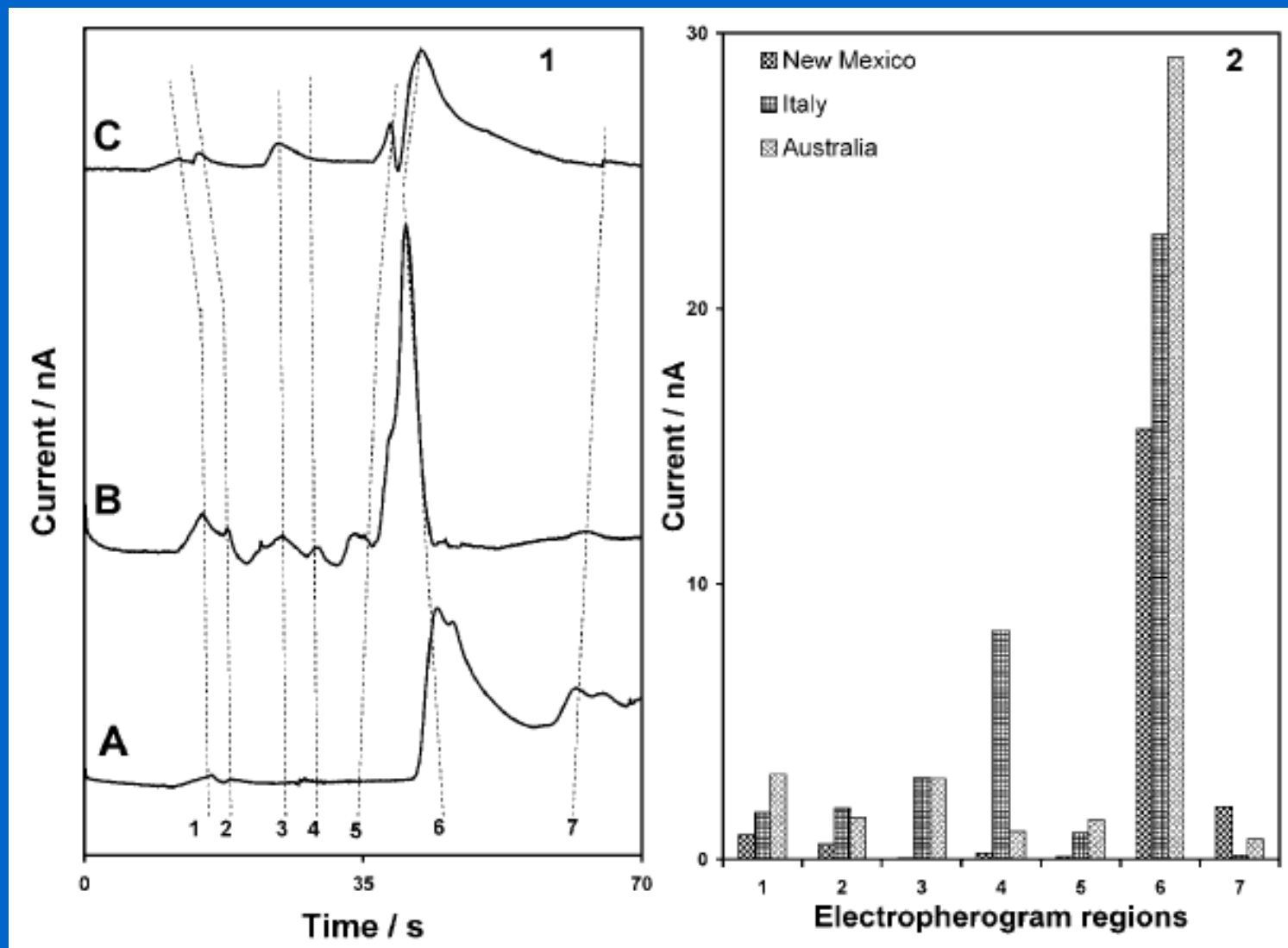
30 μM of 3NP and 60 μM of 2NP, 4NP, DNC, and DNP

Type Analysis



30 μM of 3NP and 60 μM of 2NP, 4NP, DNC, and DNP

Histogram

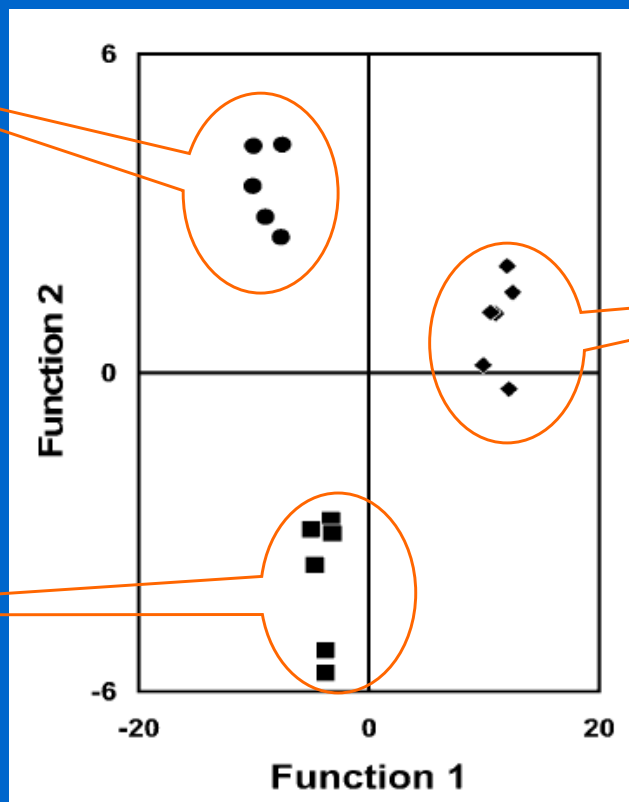


A: New Mexico; B: Australia; C: Italy.

Wine Characterization

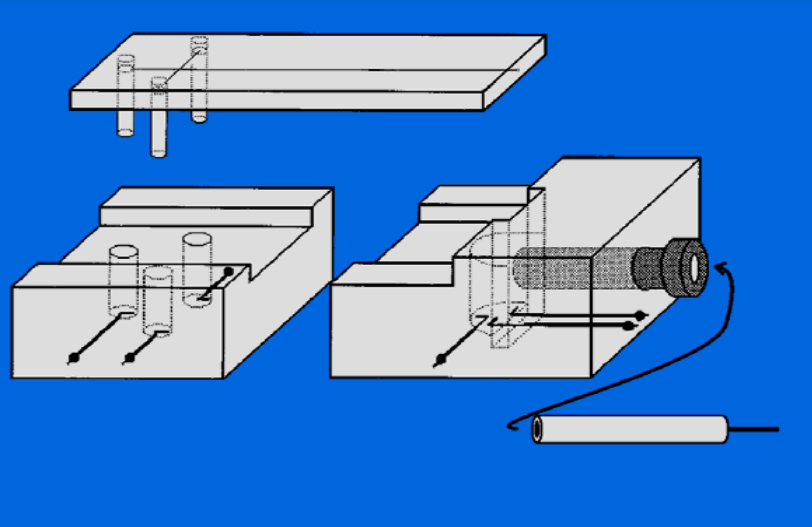
New Mexico

Australia



Italy

Portable arrangement



Conclusion

- Development of separation method
- Applicability of electrochemical detection
- Application to model sample of nitrophenols
- Type analysis
- Portable arrangement

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Thank you for your attention

Acknowledgement

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EPA STAR Program
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