Development of Instruments for Real-time Water Monitoring

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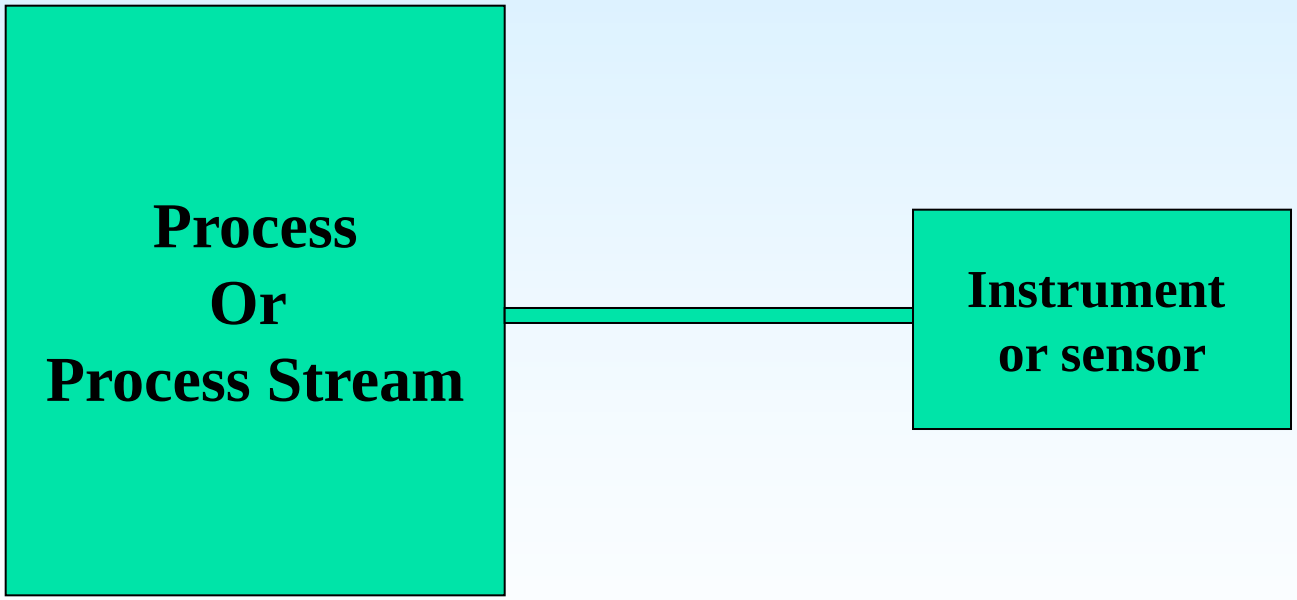
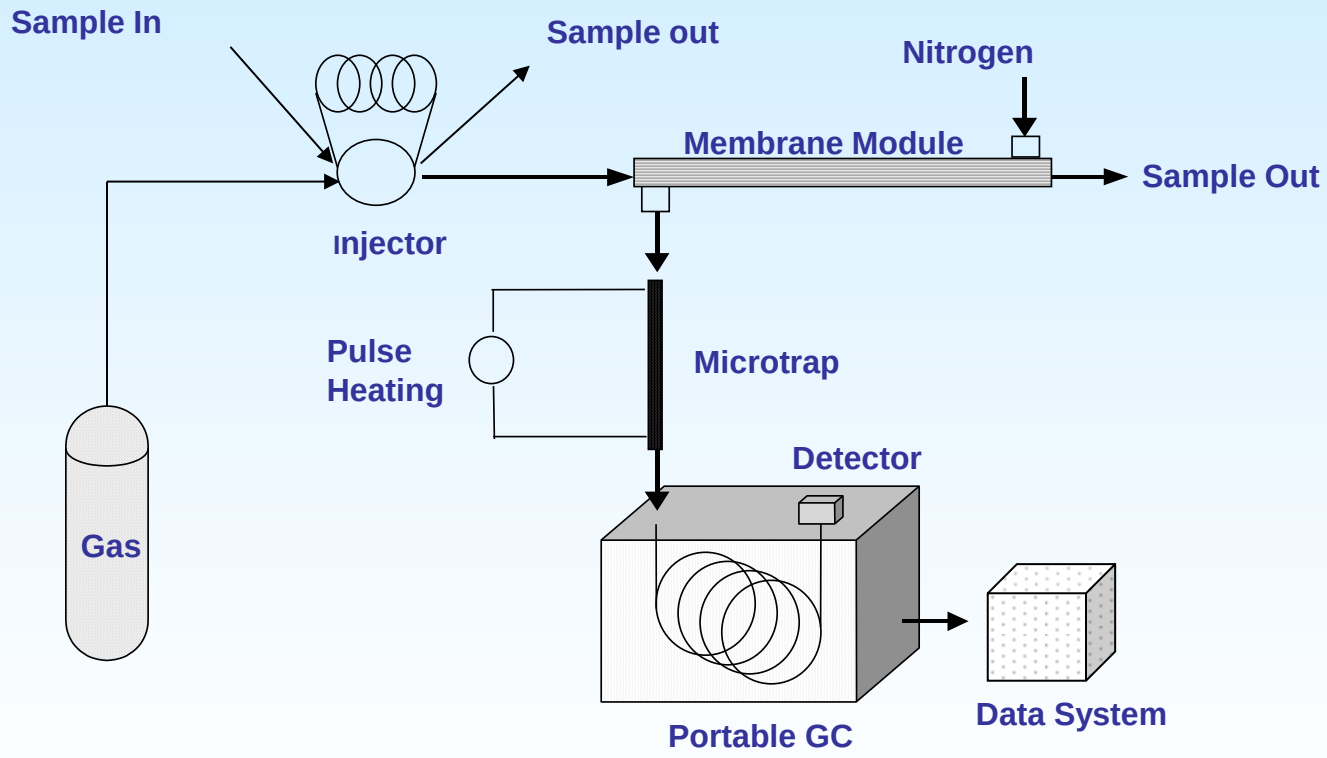
On-line Real-time Monitoring

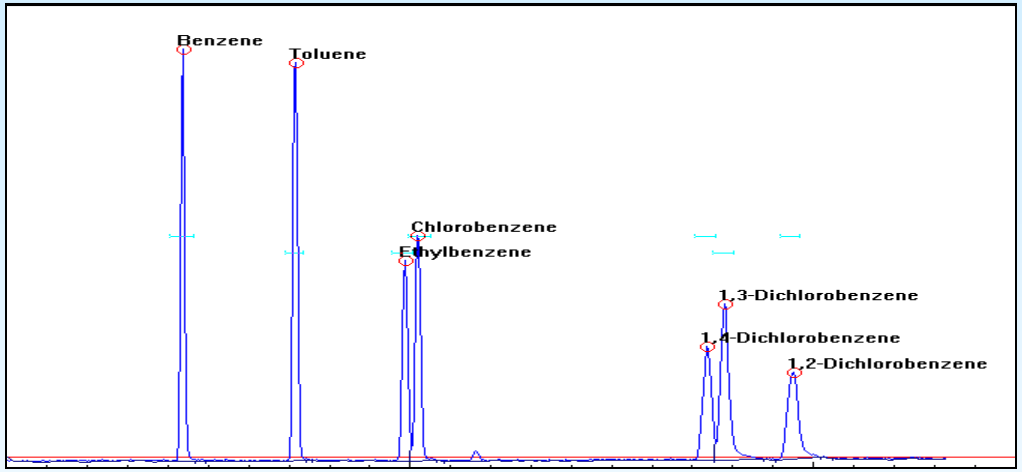


Real-time Monitoring of VOCs Ground Water Using Gas Injection Membrane Extraction (GIME)

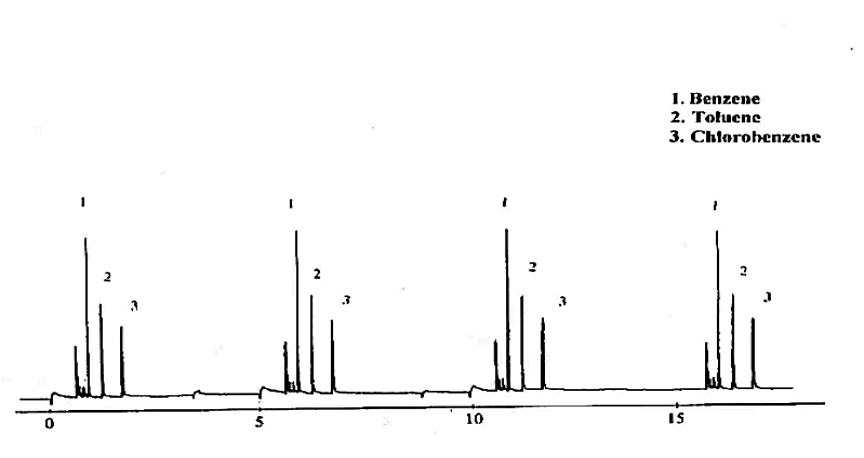


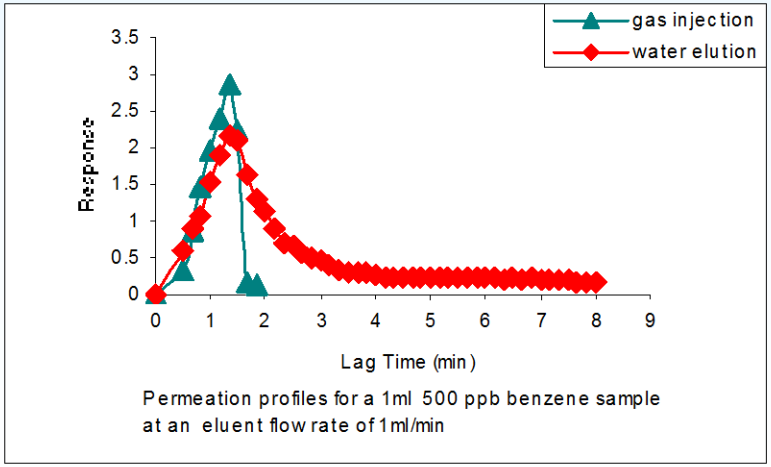
1. K. Hylton and S. Mitra. *J. Chromatogr. A,* 2007, 1152, 199–214.
2. D. Kou and S. Mitra, Anal. Chem. 2001

Continuous Monitoring by GIME

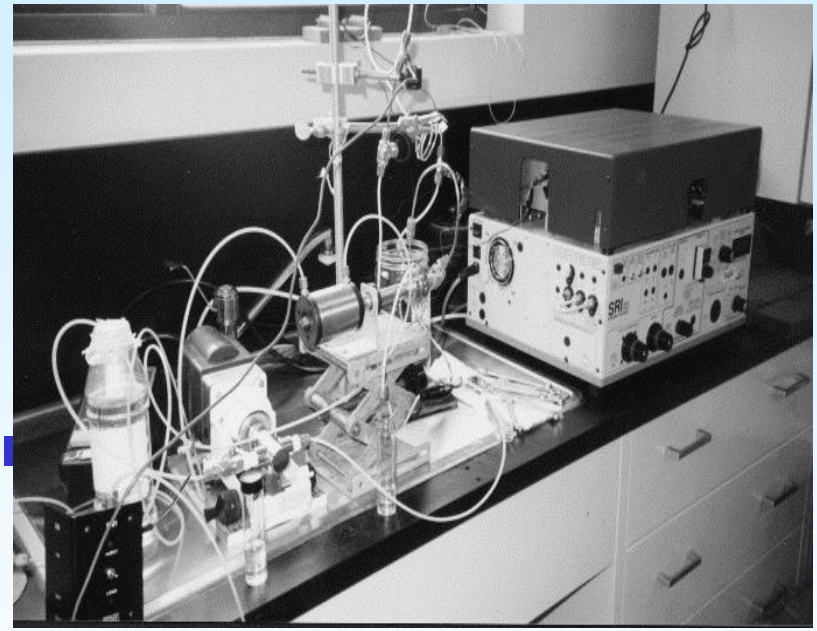


Compounds	MDLs (ug/l)	RSD (%)
Benzene	0.1	1.7
Toluene	0.1	2.3
Ethylbenzene	0.9	2.8

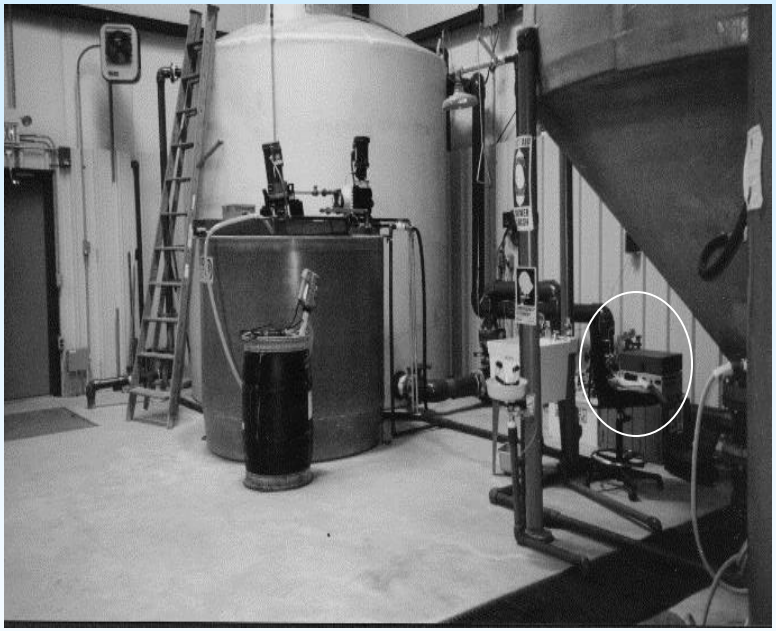




Field Testing of Gime-GC System at a Superfund Site

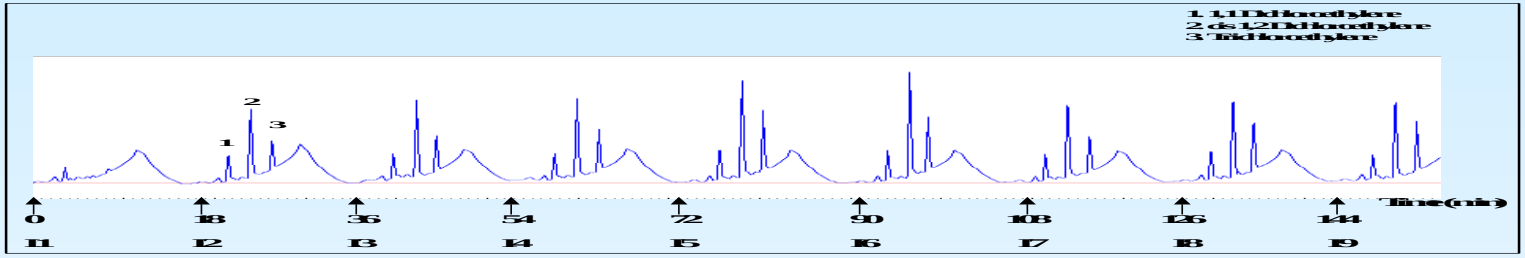


The on-line real-time monitoring system

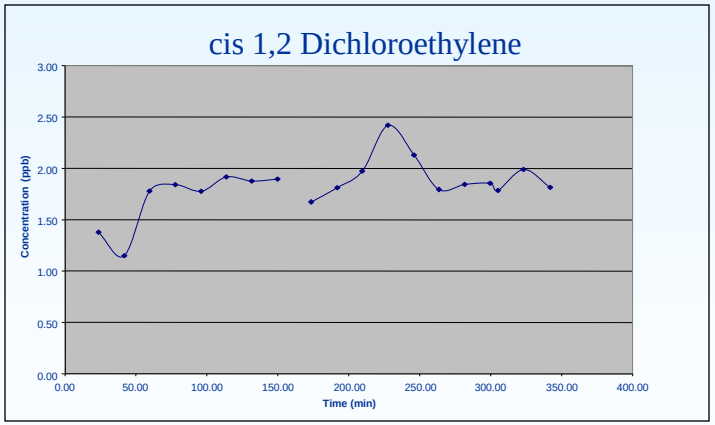


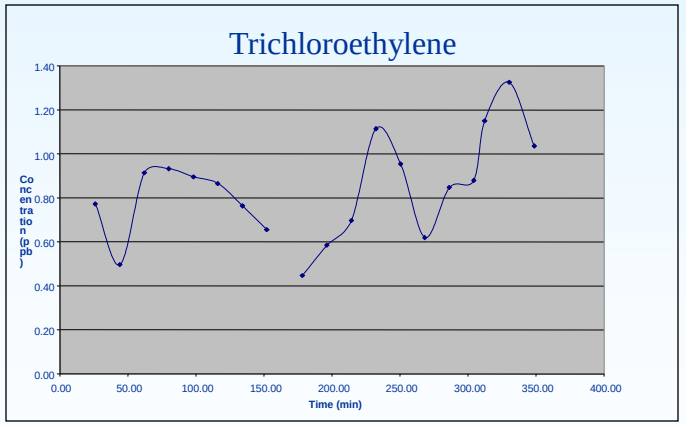
A groundwater treatment facility at the Naval and Engineering Station in Lakehurst, NJ, where the field study was conducted.

Continuous Monitoring by GIME-GC



Typical chromatograms from on-line analysis of water entering the treatment facility. Injections were made at I1, I2 etc.





Concentration Profiles over a six hour monitoring period

Steps in Trace Semi Volatile Measurements

- Extraction

  -LLE, SPE, SPME

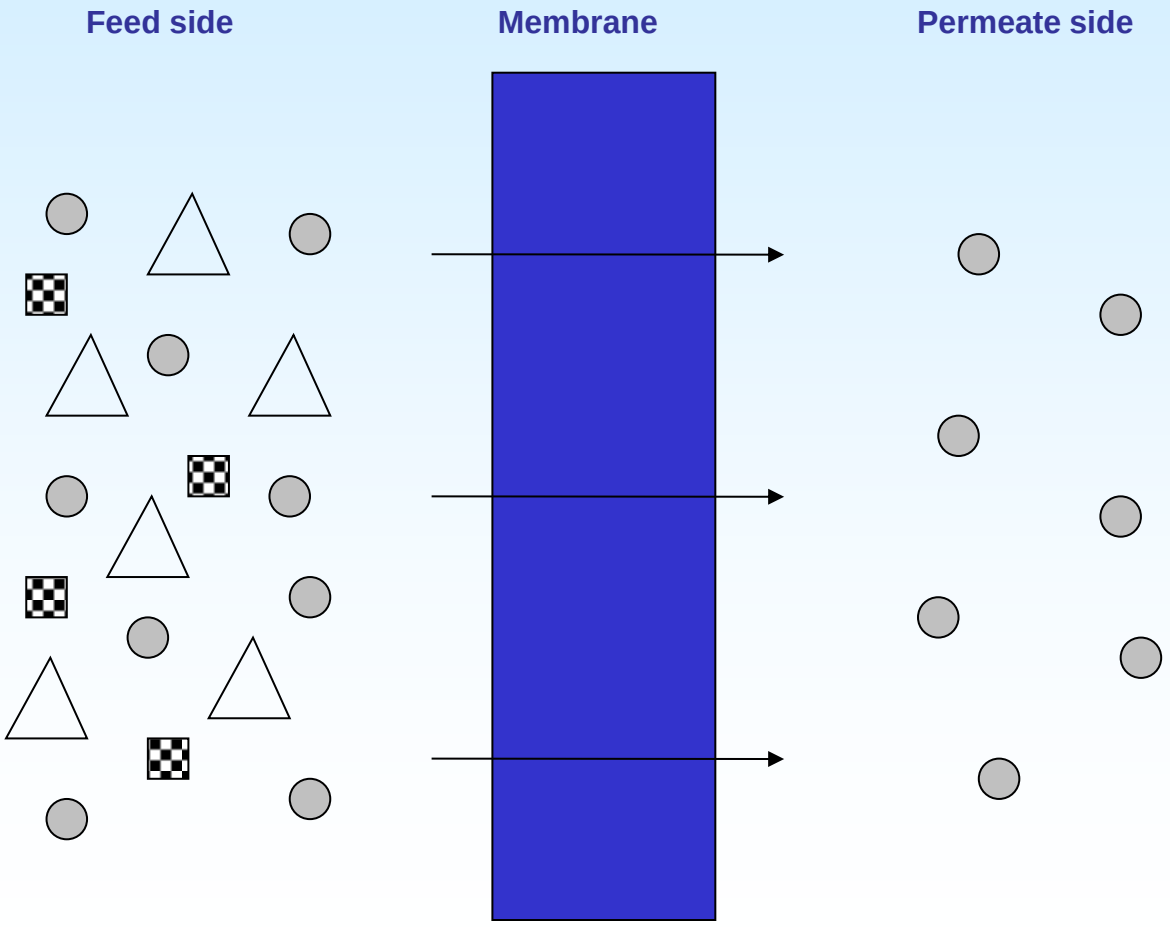
- Concentration

  -Evaporative, Membrane

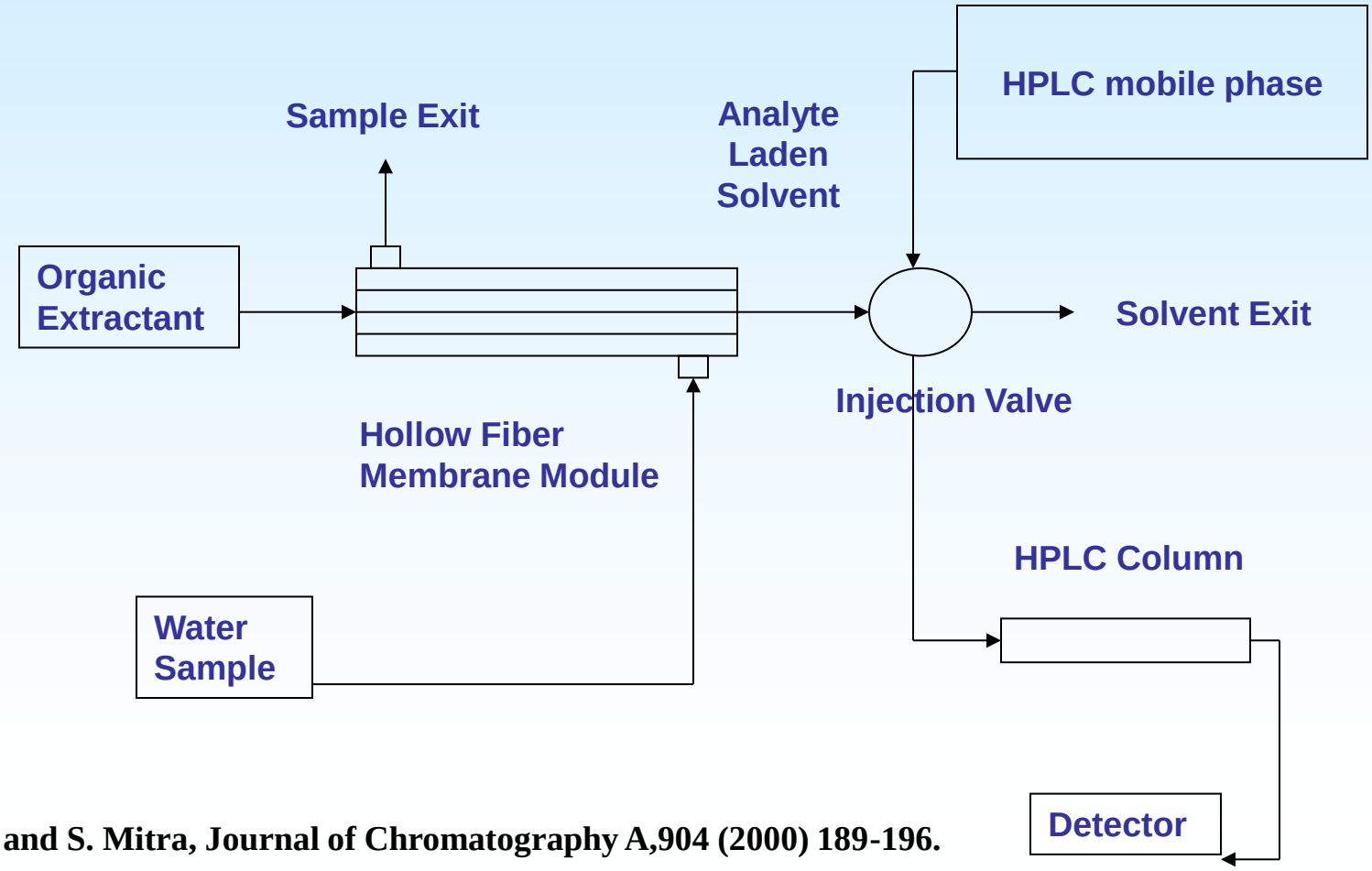
- Detection

  -GC, HPLC, MS

Membrane Extraction

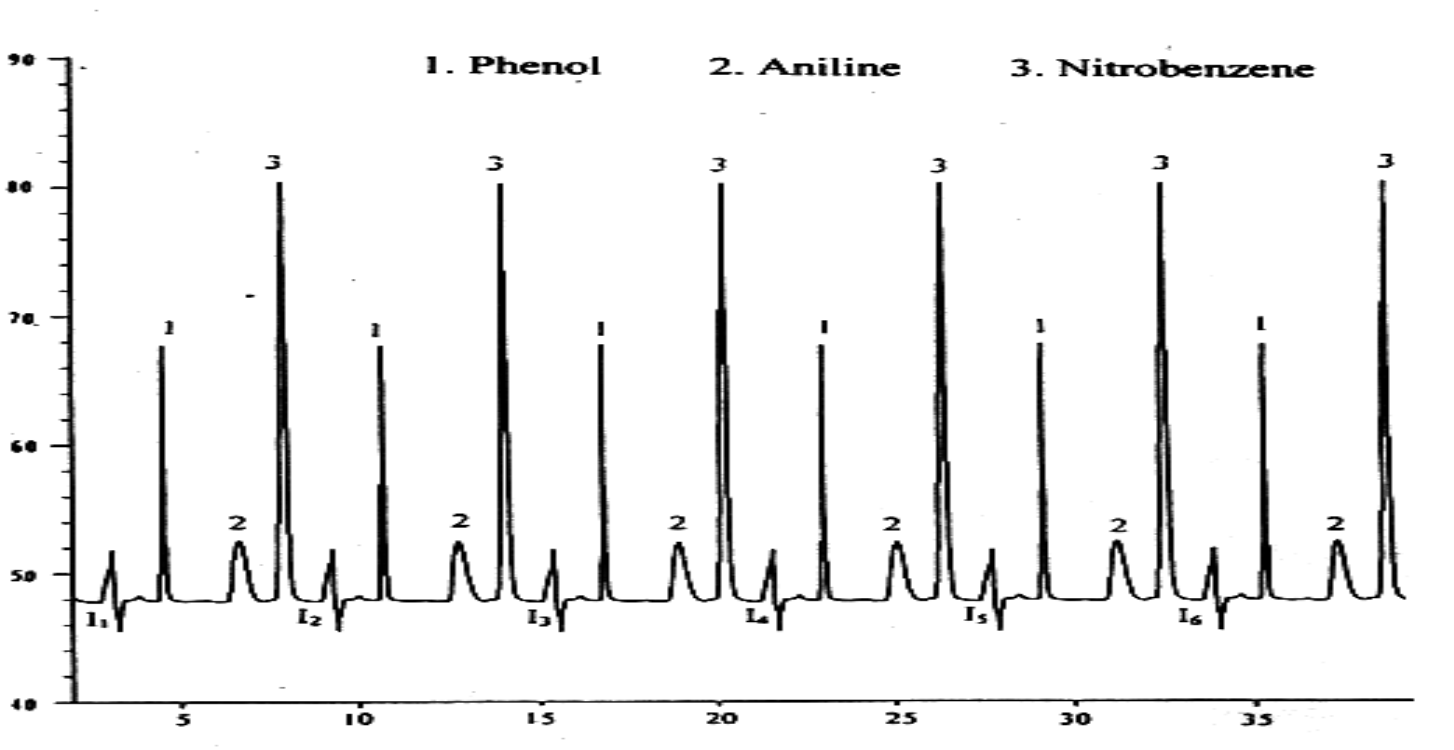


Schematic Diagram of ME-LC



X. Guo and S. Mitra, Journal of Chromatography A,904 (2000) 189-196.

Continuous monitoring by ME-LC



X. Guo and S. Mitra, Journal of Chromatography A, 904 (2000) 189-196

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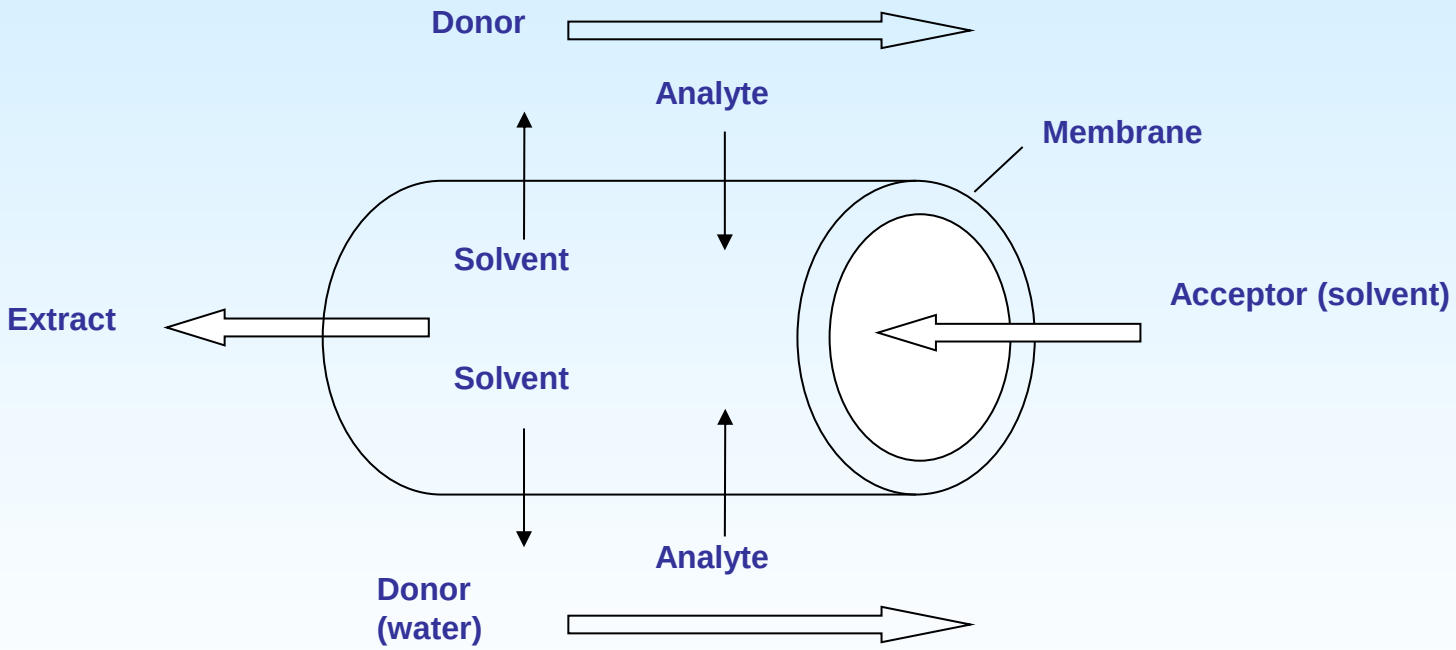
Simultaneous Extraction and Concentration



D. Kou and S. Mitra, *Analytical Chemistry* (2003).

Solubility and Solvent Loss

	Kow (Log P)	Hexane		BA		MIBK		IPA	
		EE	EF	EE	EF	EE	EF	EE	EF
PCP	5.12	68.1	36.3	69.5	101.6	43.7	153.3	26.1	203.4
Atrazine	2.61	6.5	3.5	56.2	82.2	N/A	N/A	31.6	246.6
Naphthalene	3.30	46.3	24.6	81.3	119	33.9	119	37.4	292
Water Solubility		9.5 mg/l		8.4 g/l		19 g/l		30.9 g/l	
Solvent Loss (%)		26.7		73.3		88.9		95	

Ref: D. Kou and S. Mitra, Analytical Chemistry (Nov, 2003)

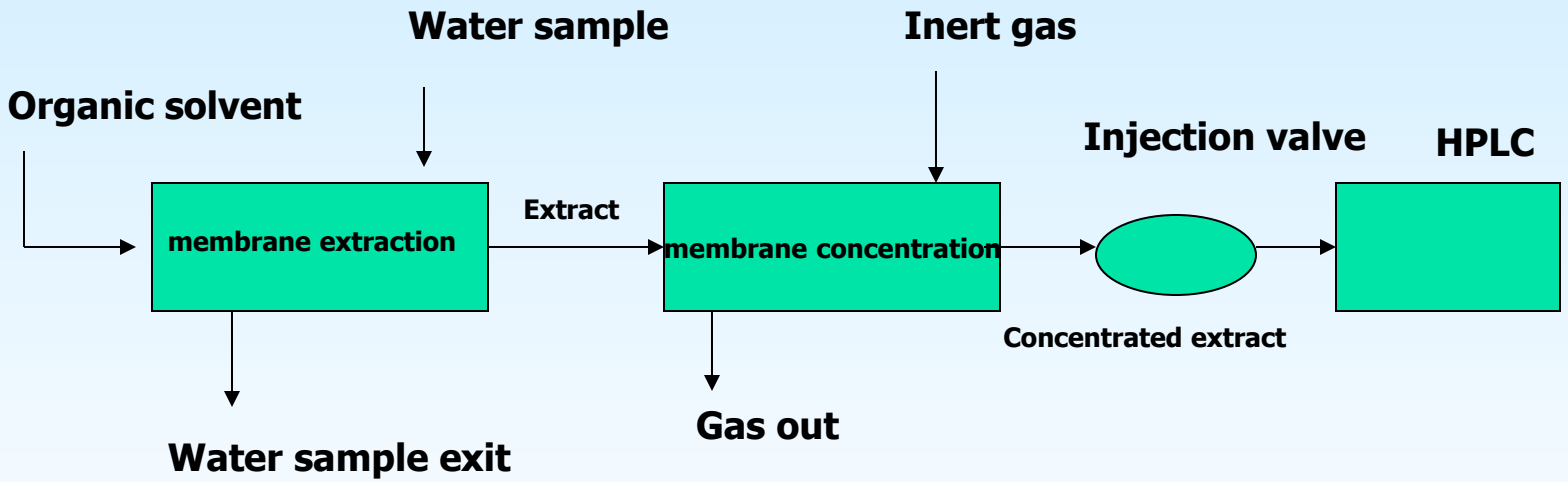
Analytical Performance

Compounds	MDL (µg/L)	RSD (%)
Atrazine	0.5	4.6
PCP	1.0	7.8
Naphthalene	0.9	6.3

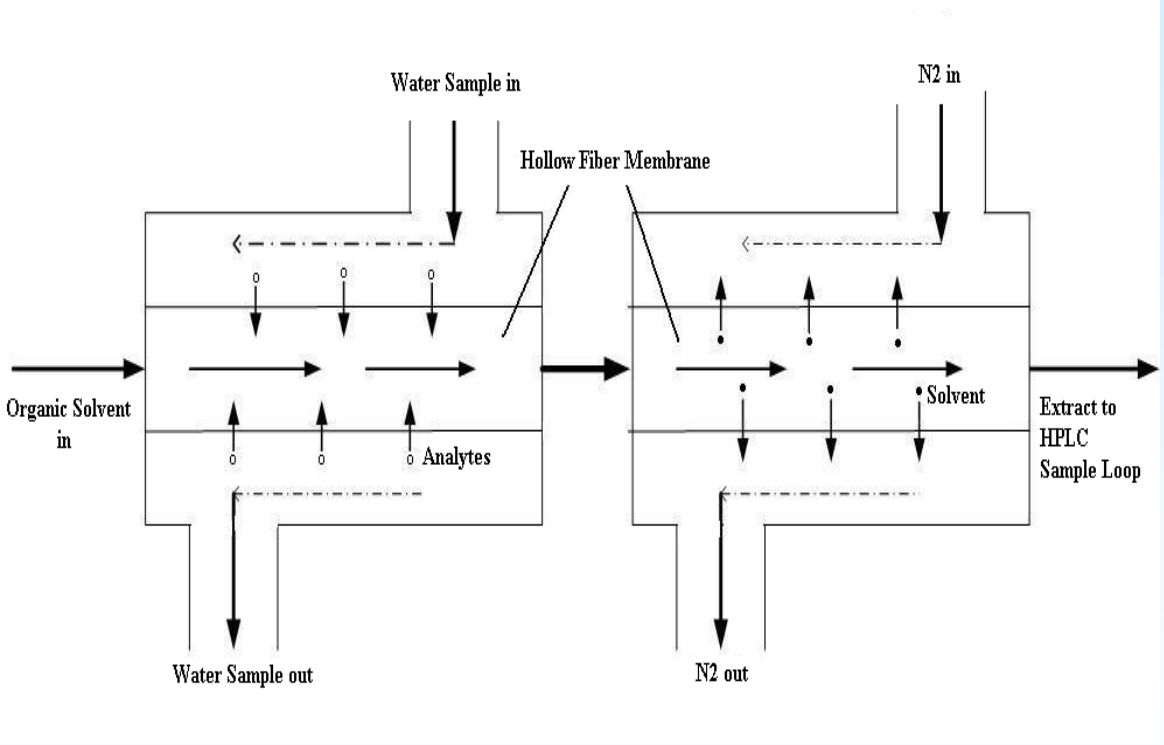
Total Analyitical System

Integrating Extraction and Concentration

Extraction with On-line Membrane Concentration

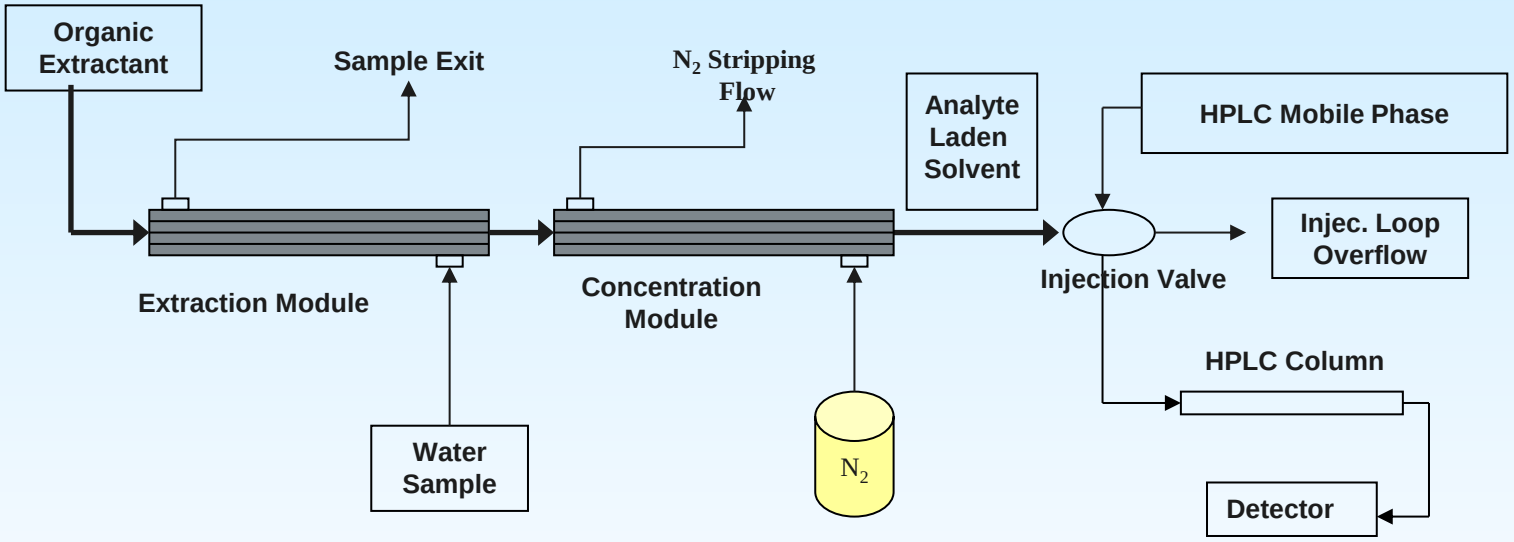


Wang and Mitra, *Journal of Chromatography A*, 1068 (2005), 237-242



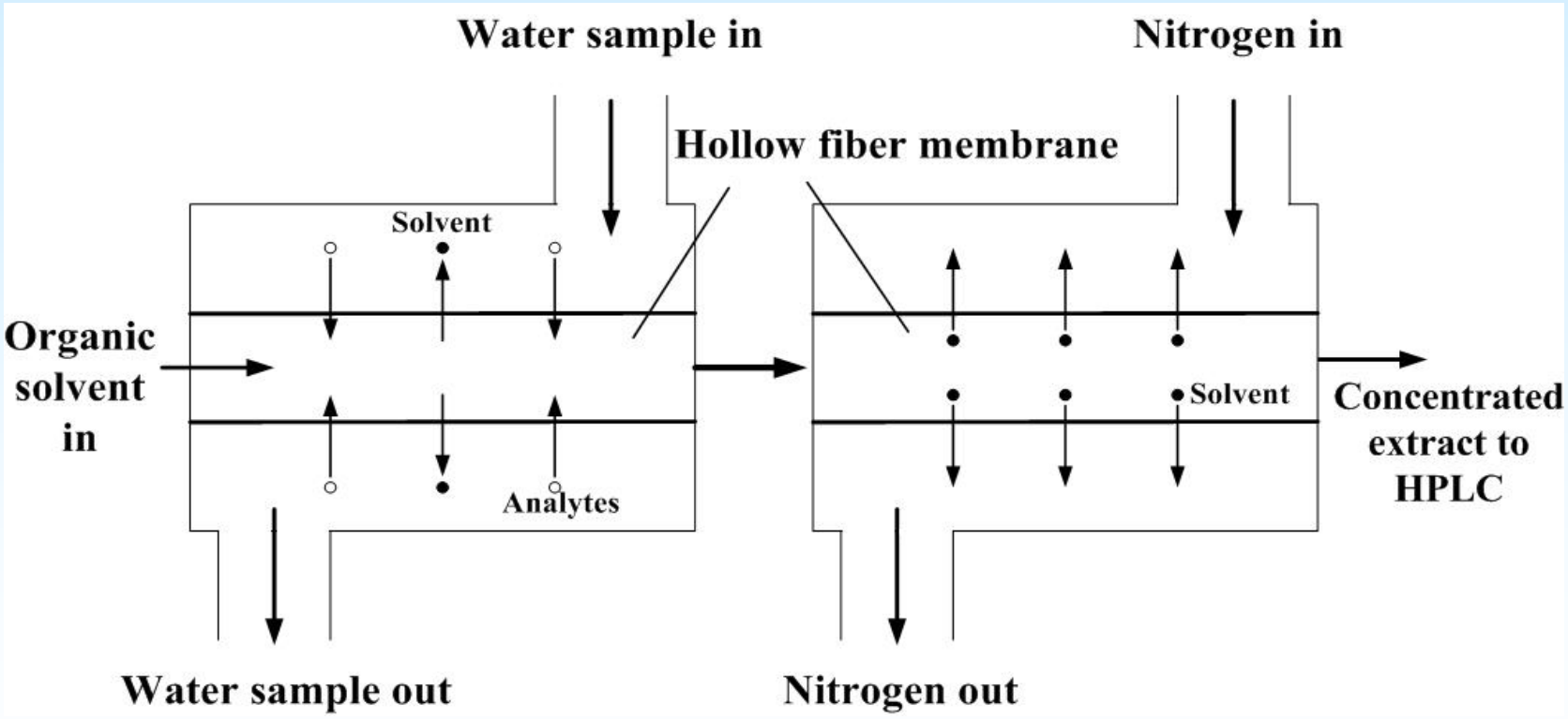
Wang and Mitra, *Journal of Chromatography A*, 1068 (2005), 237-242

Total Analytical System



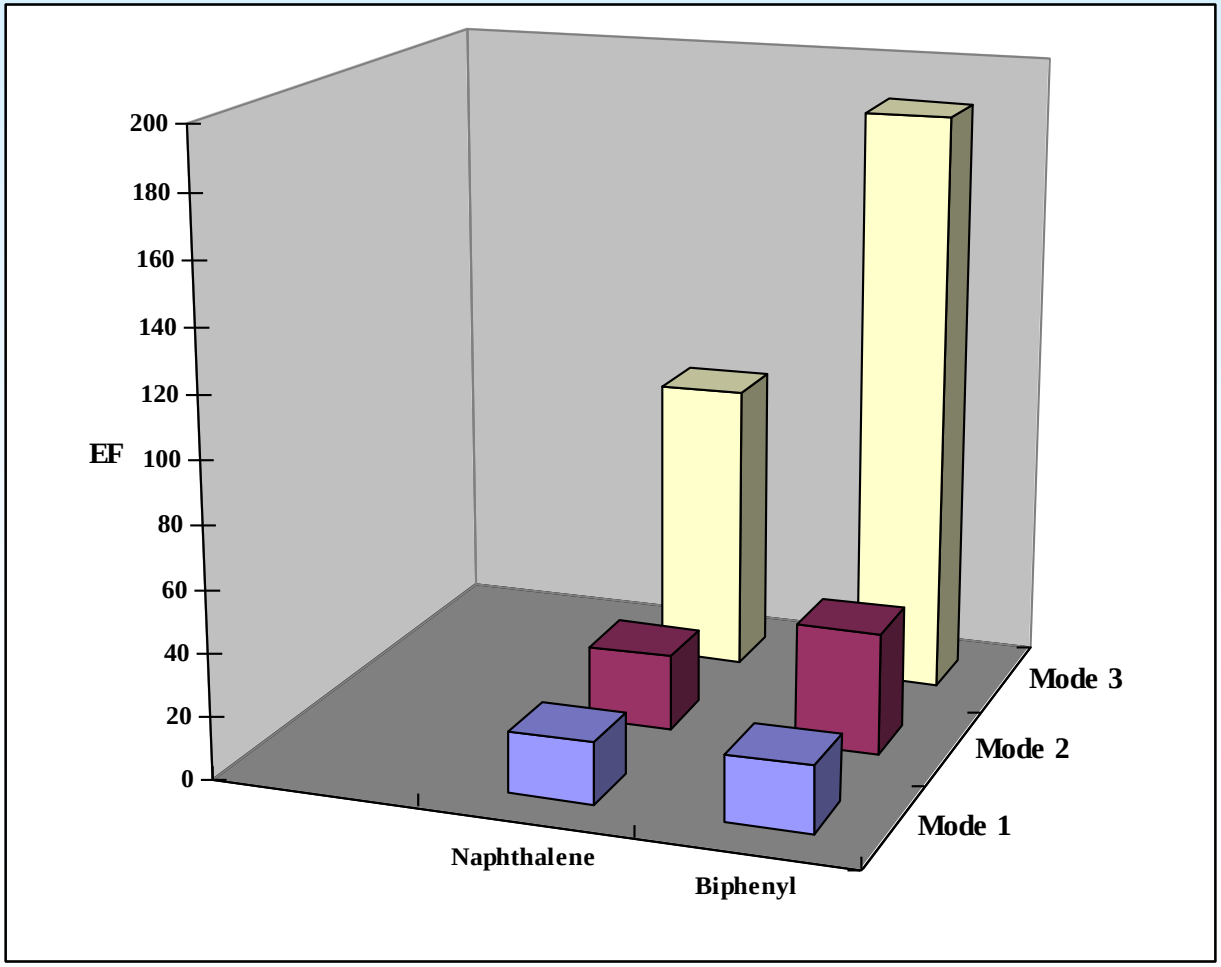
Wang and Mitra, *Journal of Chromatography A*, 1068 (2005), 237-242

Mass transfer in the TAS



Wang and Mitra, *Journal of Chromatography A*, 1068 (2005), 237-242

Comparison of EF in three experimental modes

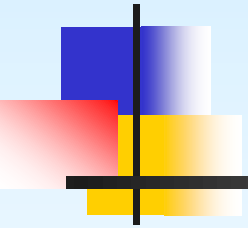


Mode 1:membrane extraction only;

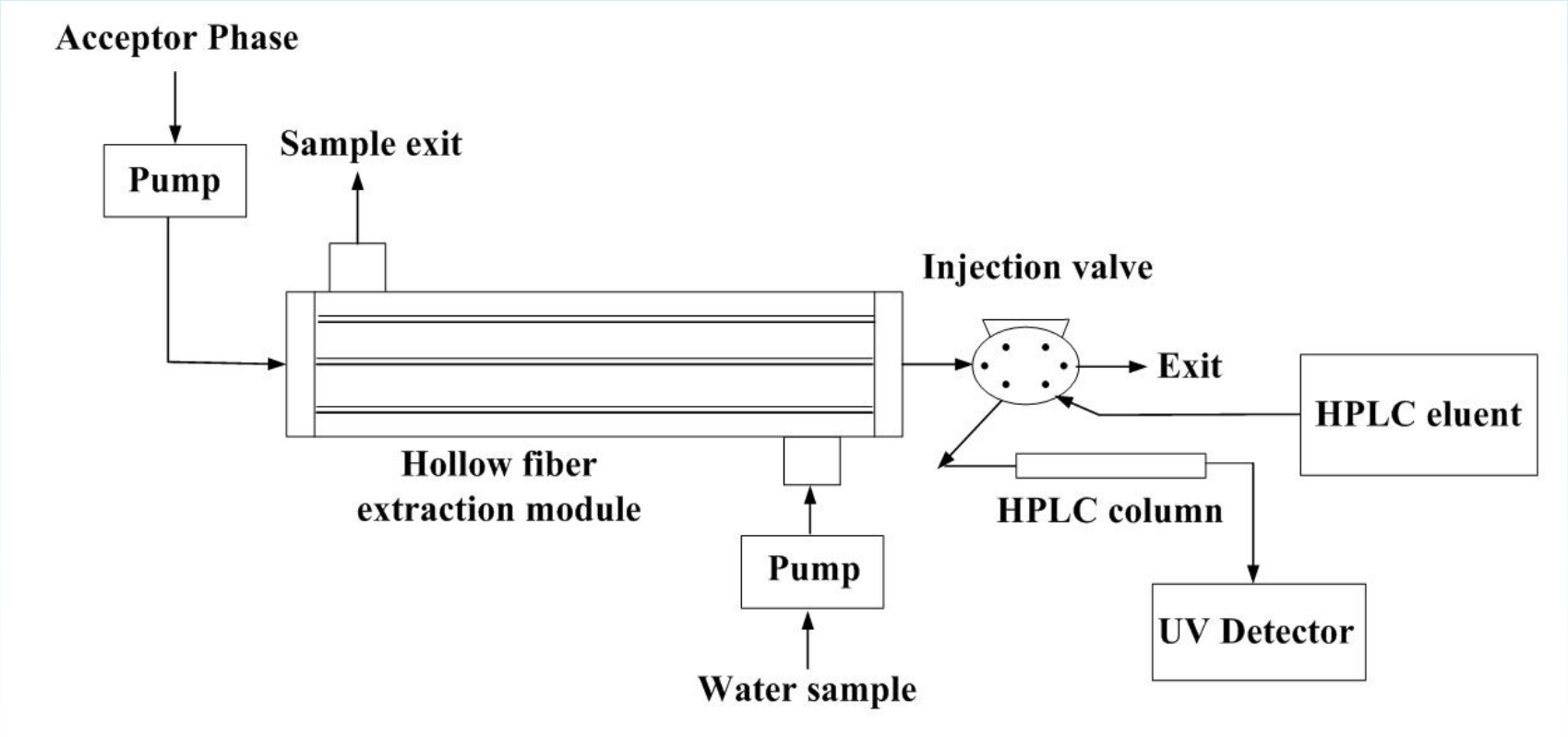
Mode 2: membrane extraction and pervaporation without N_2 stripping;

Mode 3: and membrane extraction and pervaporation with a N_2 flow rate of 45 mL/min.

Real Time Monitoring of Haloacetic Acids

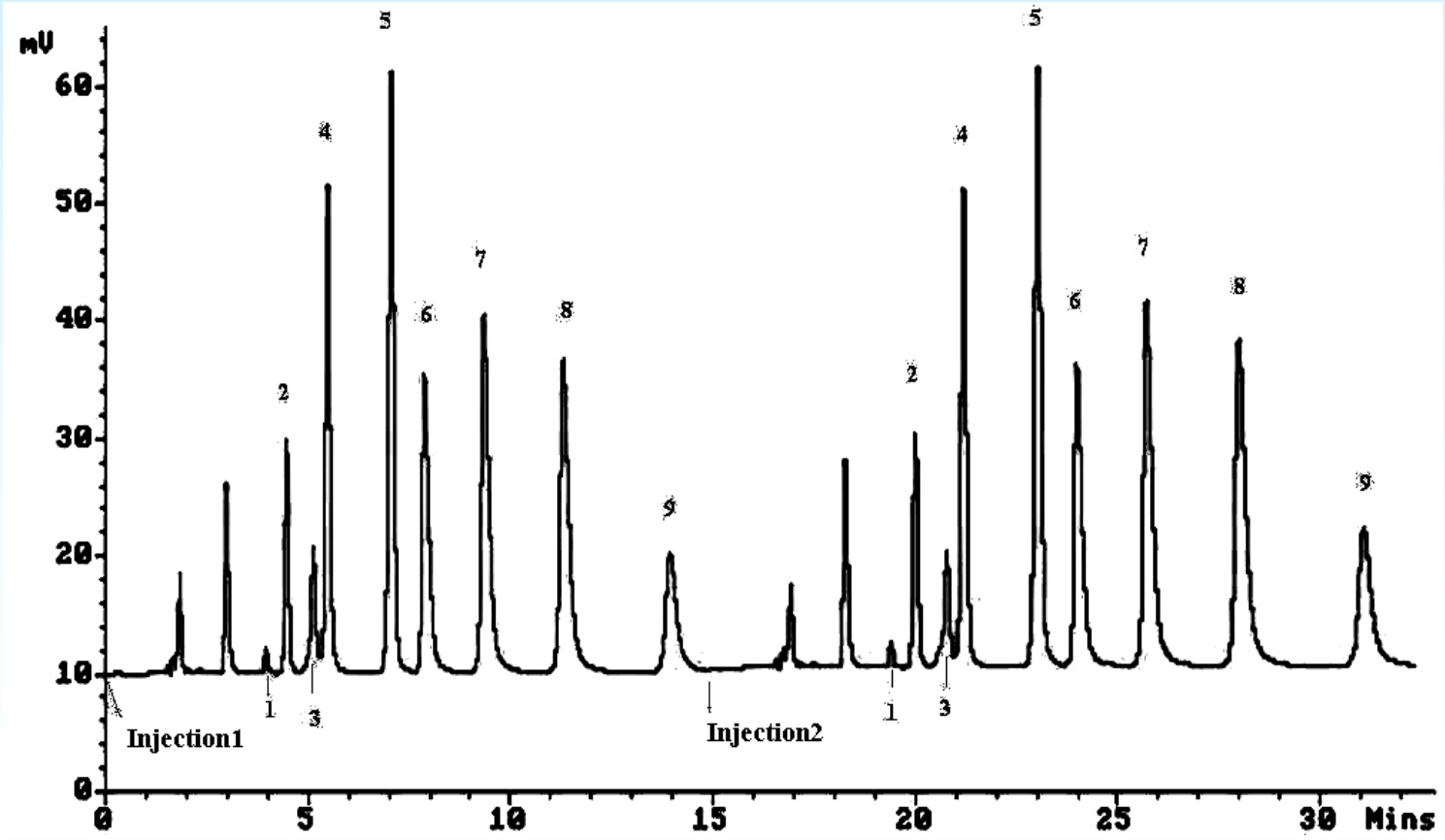


Continuous SLME-HPLC

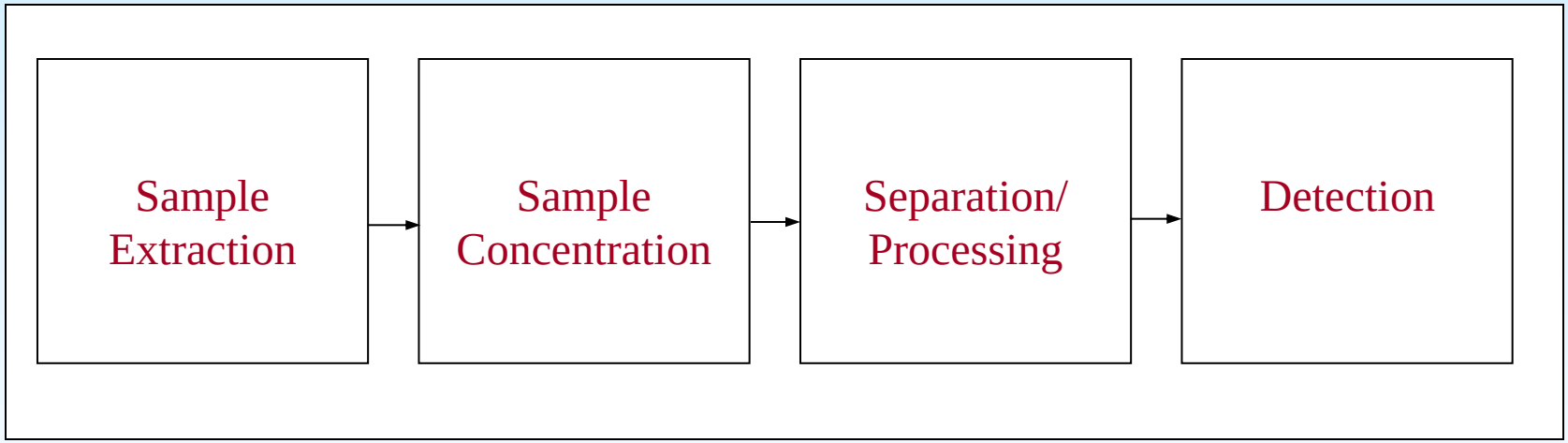


Wang, Kou and Mitra.*Journal of Chromatography A* (2005).

Series of Chromatograms from Continuous SLME of the Nine HAAs



Lab-on-a-chip, Total Analytical System



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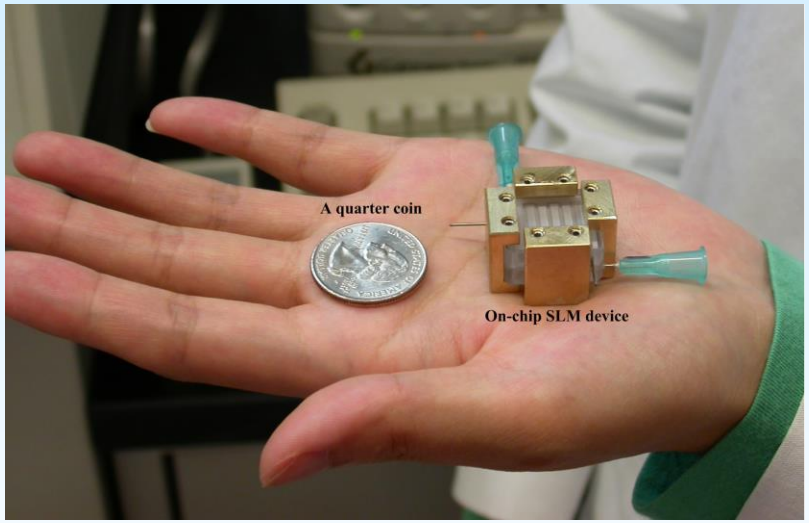
On-Chip SLMME



In Review- Anal. Chem. (2004)