Sensing Platforms

C. Saridara, M. Karwa, R. Brukh, Z. Iqbal, S. Mitra

Department of Chemistry and Environmental Science
New Jersey Institute of Technology, Newark, NJ, USA.
Schematic of the Processes

- Cell Lysis
- SPE of DNA
- PCR
- Extraction
  - Purification
  - Pre-concentration
- Electrophoresis
- Laser Induced Fluorescence Detection
Typical Approach to Trace Monitoring

Air

Sample Collection → Sample Preconcentration → Separation/Processing → Detection

Water

Extraction → Sample Preconcentration → Separation/Processing → Detection
Microtrap for Online Concentration and Injection
Response of the Microtrap Pulsed FID

J. Chrom. A. 1072 (2005) 243
Microtrap
I.D. = 0.53 mm.

Contact pad

31,580µm

456µm

Contact pad

Top View

Scaled Up Self-assembly of Carbon Nanotubes
Carbon Nanotubes

- Laser Ablation
- Catalytic Arc
- Catalytic CVD
Hydrogen Vacuum Gauge

To Vacuum Pump

Argon

Ethylene

Hydrogen

Flow Controllers

Steel Tubing

Vacuum Gauge

Furnace

Bubbler

• Catalytic Arc
• Catalytic Laser Ablation
• Catalytic CVD
\[ \text{Sample In} \xrightarrow{\text{CNT layer}} \text{Sample Out} \]

1. \[ \text{C}_2\text{H}_4 \rightleftharpoons \text{CNT} + \text{C}_2\text{H}_2 + \text{C}_2\text{H}_6 + \text{C}_3\text{H}_6 + 1-\text{C}_4\text{H}_8 + 1,3-\text{C}_4\text{H}_6 + \text{H}_2 \] (1)

2. \[ \text{2CO} \rightleftharpoons \text{CNT} + \text{CO}_2 \] (2)

500 C Treatment

700 C Treatment

Electrodeposited Cobalt
CNT-Microtrap

Diagram showing:
- Pump
- Pulse Heating
- Microtrap
- Flame Ionization Detector
- GC
- Computer
C. Saridara, R. Brukh, Z. Iqbal and S. Mitra
Anal. Chem. 2005
Gas Chromatography

Detector

GC

Computer

Columns

CNT

Graph
1500-2000 plates/m

Methane and ethylene in \(\text{C}_2\text{H}_4\)-CVD

Toluene in \(\text{C}_2\text{H}_4\)-CVD

Ethanol in CO-CVD

Hexane in \(\text{C}_2\text{H}_4\)-CVD
Potential Advantages

- CNTS offer:
  1. High capacity in the open tubular format
  2. Thermal stability at high temp.
- Fast desorption
- Fabrication by self-assembly
- Nanotubes fine-tuned to specifications.