THE DETECTION OF COCAINE VIA PHYSICALLY FUNCTIONALIZED CARBON NANOTUBE-SENSORS

REIS ZANDIER

YOUNGSTOWN STATE UNIVERSITY
CHEMICAL ENGINEERING STUDENT
OVERVIEW

• Youngstown State University
  • Senior, Chemical Engineering Student
  • Materials Science Lab

• 2nd Year as an OSGC Scholar

• Today’s Presentation
  • Experimental Methods
  • Results and Discussion
  • Conclusions
I. INTRODUCTION

• Production of 3D Printed Sensors
• Detection of Solids, Liquids, and Gasses
  • NOx
  • CO
  • Cocaine
  • Cocaine in H2O
• Objective: Prove that cocaine can be detected with the use of carbon nanotubes on 3D printed sensors
CARBON NANOTUBES

- Use of carbon nanotubes as the core detection material seems to represent a very promising nanostructure for detecting chemical agents.
- The electrochemical properties of the nanostructures is the most promising sensing platforms of carbon nanotubes.
- Novel supporting platforms are required where embedded circuits can be placed to assemble complex and intricate structures.
- Used Single Wall COOH Functionalized Carbon nanotubes.
II. EXPERIMENTAL METHODS

• Mixed solutions of COOH-CNT’s at differing concentrations with Epinephrine and Norepinephrine
• Preparation of Sensors
• Series of Testing using DATAQ with WINDAQ Software
• Data Analysis using Excel
**SENSOR CONDITIONS:**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Concentration (CNT: E/N) E = Epinephrine N = Norepinephrine</th>
<th>Tested With</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>1:1 E</td>
<td>Pure Water</td>
</tr>
<tr>
<td>1B</td>
<td>1:1 E</td>
<td>Cocaine in Water</td>
</tr>
<tr>
<td>2A</td>
<td>1:1 N</td>
<td>Pure Water</td>
</tr>
<tr>
<td>2B</td>
<td>1:1 N</td>
<td>Cocaine in Water</td>
</tr>
<tr>
<td>3A</td>
<td>2:1 E</td>
<td>Pure Water</td>
</tr>
<tr>
<td>3B</td>
<td>2:1 E</td>
<td>Cocaine in Water</td>
</tr>
<tr>
<td>4A</td>
<td>2:1 N</td>
<td>Pure Water</td>
</tr>
<tr>
<td>4B</td>
<td>2:1 N</td>
<td>Cocaine in Water</td>
</tr>
</tbody>
</table>
PREPARATION OF SENSORS

• 20 micro liters of each solution pipetted onto the sensor

• Cured at 60°C for 60 minutes
RESULTS AND DISCUSSION
1:1 WATER VS COCAINE IN WATER
2:1 WATER VS COCAINE IN WATER

2:1 (CNT:Epinephrine)

- Tested With Pure Water
- Tested With Cocaine in Water

Normal Resistance

Time (Seconds)
COMPARING 1:1 VS 2:1
(CNT: EPINEPHRINE)
IV. CONCLUSIONS

• Cocaine detection found
  • Difference in amount of change when identical sensor tested with pure water vs cocaine in water
  • Higher increase in resistance with pure water vs cocaine in water

• Change in Concentration of CNT : Epinephrine
  • Higher Concentration of CNTs (2:1) showed less deviation in testing with pure water vs cocaine in water

• Future Work
  • Implementing into a 3D Printed Coin
  • Electronics
  • LED Sensing Light
REFERENCES