



Photonic "Sniffer"

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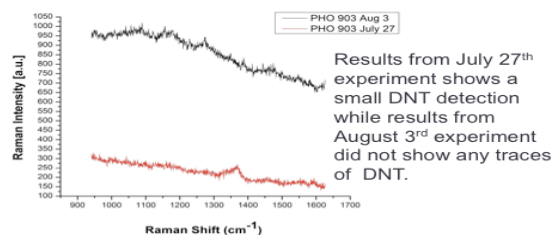
Abstract

The Photonic Sniffer is a biodetection platform that is designed to have as high sensitivity as a bomb-sniffing dog. The technology has demonstrated differentiation between various chemicals and successfully identified the target.

Learn about spectroscopy, nanofabrication and nanophotonics. Build on previous experiment to design a sensor that can reliably detect trace amounts of explosive materials

In this RET, we utilized LEGO Mind Storm robots to head to the high hazard zone, wait for the designated period of incubation for the chip, return to the home site and then transport to the detection platform.

PHO903 Test Results – July 27th & August 3rd

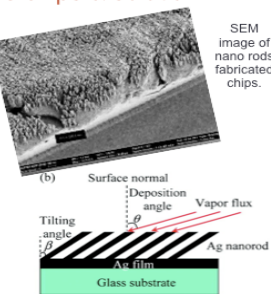


Conclusion

- The gold nano-rod fabricated chips can detect small traces of DNT chemicals but due to our inability to reproduce our initial results, more experiments need to be executed to obtain conclusive evidence.
- Although we concluded that the gold nano-rods were less effective in capturing small traces of DNT than the polymer fabricated chip. We believe the gold nano-rods can be use in the detection of explosive devices but a better NaOH solution needs to be created.
- A new design for a chip that can retain more of the NaOH solution by reducing the evaporation time of the solution should be explored.
- Explore the possibility of designing a larger robot that can carry a portable SERS for real-time reporting of data.

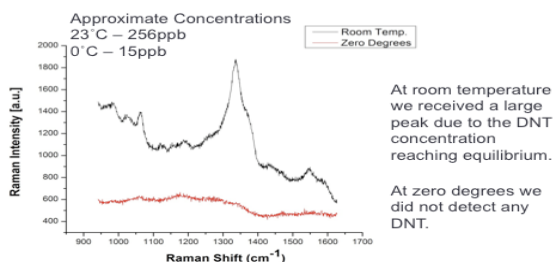
Fabrication of the chips & solution

- Started with silicon substrate
- After cleaning, deposited 5nm of Cr, then 50 nm of Au, followed by 500 nm of Au nanorods @ 84° from normal
- Plasma cleaned all chips
- Prepared 10 mM NaOH solution



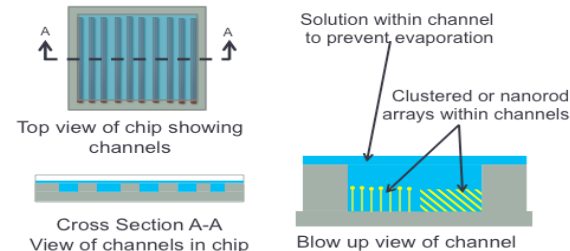
Source: Liu, et. al., *J. Phys. Chem. C* 2010, 114, 8176-8183.

Test Results – Room Temperature & 0°C



Possible New Chip Design

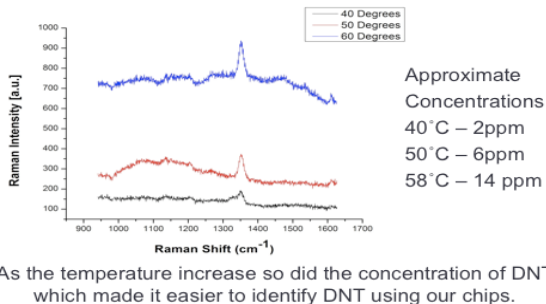
- Design a chip with "channels" for storage of solution



Data and Results

- ✓ We were not able to test the effectiveness of chip at different distances, but did receive promising results.
- ✓ The amount of NaOH solution on the chip had a major impact on the quality of the measurements.
- ✓ Timing of the process was critical to obtaining good measurements – drying time of NaOH.
- ✓ Variety of "background" measurements impacted results.
- ✓ Concentration of solid DNT effected results and the consistency of our experiments.
- ✓ The greater the amount of concentration results in greater Raman intensity.
- ✓ The NaOH solution is best when used within a week of being formulated.

Test Results – Different Temperatures



Acknowledgements

I would like to thank everyone in the Reinhard Lab for providing us with assistance during our RET. Dr. Bjorn Reinhard, Jing Wang, Bo Yan, Yan Hong. Also, the RET/BU staff for the opportunity to take part in this program this summer: Cynthia Brossman, Mike Ruane, Helen Fawcett, Paul Mak. and lastly my partner Ned Dawes.

