



Limit of Detection on NDMA Using SERS and Silver Nanoparticles

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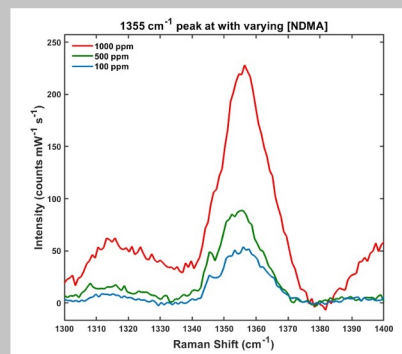
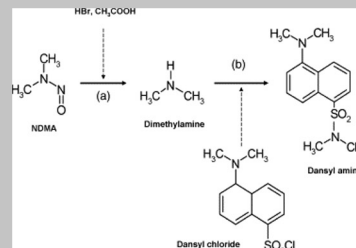
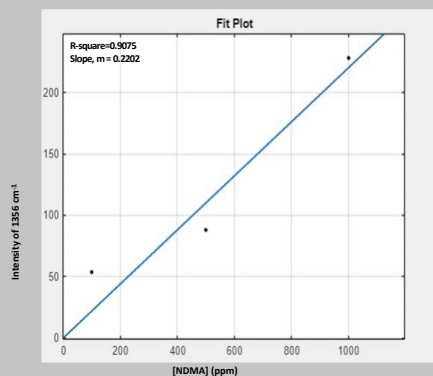
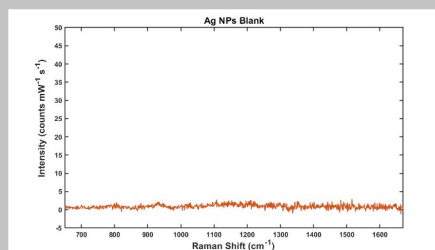
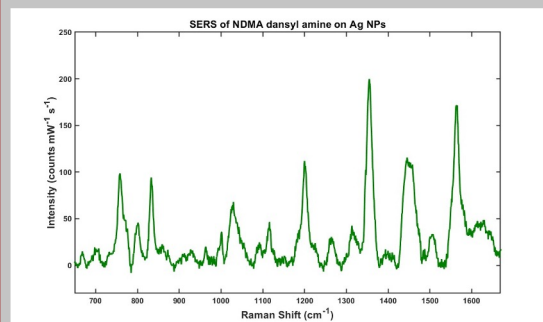
Introduction

Nitrosodimethylamine (NDMA) is an organic compound that can be found anywhere. It is known as a toxic carcinogen. NDMA doesn't have much research done due to its recent discovery. NDMA has been linked to issues like gastric and colorectal cancers. Our goal is to find the limit of detection (LOD) with Surface Enhanced Raman Spectrometry (SERS). SERS uses lasers to detect the absorbed light in a substance, and Nanoparticles are used to amplify the signals made by the Spectrometer. This allows single molecules to be detected in a substance. In this experiment we used Silver Nanoparticles. So far other ways of finding NDMA have LODs of 0.08 parts per million (ppm) (LC-MS/MS). We hope to get lower than this detection in order to be able to detect NDMA with greater accuracy.

Methods

- Silver (Ag) Nanoparticles were created in nanoparticle synthesis
- Five separate concentrations of NDMA ranging from 100 - 1000 ppm were dissolved in Silver Nanoparticles
- The laser used was set at an intensity of 633 nm and each sample gave 5 attempts in order to avoid error
- Graphs were created from the spectrometer and downloaded
- Put the graphs that we got through MATLAB in order to reduce noise and get clean data

Results



Standard deviation, $\sigma = 2.1635$
Slope, $m = 0.2202$

$$\text{LOD} = \frac{3\sigma}{m} = 29.48 \text{ ppm}$$

Experience

This research based internship at Notre Dame has been an amazing opportunity to experience a college level facility and learn valuable skills. Skills such as patience, data analysis, ability to learn, and much more.

Conclusions

Our research shows a limit of detection of NDMA using Silver Nanoparticles is 29.48 ppm. While this isn't the lowest method for detecting NDMA, it still came through as a successful method. Through much trial and error and bumps along the way, I'm proud that I could assist in a discovery that could potentially help someone.

Acknowledgements

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