REU 2013 Events

1) Everglades Cycling
2) Villa Vizcaya – A unique piece of Miami History
3) Fruit and Spice Park & Schnebly Wineries Tour
4) Kayaking at the Oleta River
5) Final Poster Symposium
Analysis of Household Powder by Gas Chromatography-Mass Spectrometry and Electrospray Ionization Ion Mobility Mass Spectrometry

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**Abstract**
A fast analytical method incorporating electrospray ionization-ion mobility spectrometry (ESI-IM-MS) was developed and used for the analysis of a number of explosives containing explosives powders. The optimum analytical conditions were obtained in positive ionization mode with a drift tube temperature of 150°C, an applied field of 250 Volts/cm, and a drift time of 1.0 milliseconds. The source voltage was kept at 3.3 kV. The analytical conditions were optimized using standard solutions of the analytes. Several commercial brands of different explosives powders were analyzed using ESI-MS/MS resulting in the identification and characterization of 10 target analytes. This technique is a rapid alternative to the current methods for identification of explosives powder using GC-MS as the results can be obtained in just 20 minutes instead of 30 minutes. A parallel study using GC-MS analysis was also conducted as a reference analytical method.

**Introduction**
Household powders were developed as an alternative to black powder and black powder, and are used for self-defense and for entertainment to the general public. Household powders are low explosives which are not regulated by the law. They can be easily purchased from a variety of stores. Some common examples of explosives that are used in household powders include: triethylamine (TEA), triethylamine (TMA), and tetryl (TTA). Some common explosives used in household powders include: triethylamine (TEA), triethylamine (TMA), and tetryl (TTA). Some common explosives used in household powders include: triethylamine (TEA), triethylamine (TMA), and tetryl (TTA). Some common explosives used in household powders include: triethylamine (TEA), triethylamine (TMA), and tetryl (TTA).

**Methods**

- **Mass Spectrometry (MS)**
- **Ion Mobility Spectrometry (IM)**
- **Electrospray Ionization (ESI)**

**Results**

- **Sample Preparation**
- **Instrumentation**
- **Data Analysis**

**Discussion**

- **Comparison of Techniques**
- **Future Research**
The Effects of DNA Sequence and Structure on the Activities of Exonuclease III

Introduction

Eukaryotic cells sequentially add and remove adenosines from the 5' end of DNA during replication. This process is mediated by the nucleosome remodeling and histone deacetylase (NURD) complex. The NURD complex recognizes and binds to DNA and removes adenosines from the 5' end of DNA. The NURD complex is a complex of multiple subunits, including the histone deacetylase (HDAC) and the nucleosome remodeling and histone deacetylase (NURD) complex.

Results & Discussion

The NURD complex is a complex of multiple subunits, including the histone deacetylase (HDAC) and the nucleosome remodeling and histone deacetylase (NURD) complex. The NURD complex recognizes and binds to DNA and removes adenosines from the 5' end of DNA. The NURD complex is a complex of multiple subunits, including the histone deacetylase (HDAC) and the nucleosome remodeling and histone deacetylase (NURD) complex.

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References

Photooxidation of Urocanic Acid

Generation of Singlet Oxygen

Urocanic Acid

Product identification

Detection of Singlet Oxygen

EP Products

Activation Energy

Possible Reactions of O₂ and UCA

Regeneration of Starting Material
Influence of Amine Density on Conjugated Polymer Nanoparticle Formation and Complexation

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Polymer (Chimer and Parent) Syntheses

Unsaturated Bond (1) must be incorporated into the backbone and within the polymer backbone to allow for DTP formation.

Complexation of Polymer with Amine

Complexation of Polymer with Amine
Photooxidation of Urocanic Acid

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Generation of Singlet Oxygen

Singlet oxygen (\(O_2^*\)) is the lowest excited electronic state of molecular oxygen, and is much more reactive than the triplet ground state. One way to generate \(O_2^*\) is by photosensitization.

Urocanic Acid

Urocanic acid (UCA) is a metabolite of histidine located in the outermost layer of the human skin, the stratum corneum. Trans-UCA absorbs UV light and therefore was thought to be a potential sunscreen and was even added to some sunscreens. Studies showed that trans-UCA inhibited photosensitization, which may be an important factor in the protection against UV-induced skin damage.

Product Identification

The \(^1H\) NMR spectrum showed the presence of two EP products, 1a and 1b, due to the tautomeration of UCA. The coupling constants of both products were characteristic of trans double bonds, which gave the possibility of products 1a or 1b, but the lack of an aldehyde peak in the spectrum led 1b as the only possible product.

Detection of Singlet Oxygen

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Activation Energy

An Arrhenius plot was created for each tautomer in order to calculate the activation energy of the retro Diels-Alder reaction.

\[
\ln(k) = -\frac{E_a}{R} \cdot \frac{1}{T} + \ln(A)
\]

\[E_a = 20.2 \text{ kJ mol}^{-1}\]

Conclusions

- Photooxidation of UCA in \(O_2^*\) produced two endoperoxide products due to the tautomeration of UCA.
- Surprisingly, the EPs were very stable up to 40°C compared to similar EPs in organic solvents which decomposed at 50°C.
- When heated, the EPs decomposed to regenerate UCA at high yields and singlet oxygen.
- EPs was added to the EP solution to detect the regeneration of singlet oxygen. The appearance of EP products after heating the EP solution.
- The activation energies of the decomposing major and minor EP were 208.5 kJ mol\(^{-1}\) and 223.1 kJ mol\(^{-1}\), respectively.

References


Acknowledgments

This is the first report of a stable intermediate. Previous experiments have only characterized the unstable EP products in organic solvents by high-temperature NMR and hence, formation of the EP products is solvent dependent.

Dr. Kevin E. O'Shea is thanked for his helpful comments and Dr. Kevin E. O'Shea is thanked for his helpful comments and Dr. Kevin E. O'Shea is thanked for his helpful comments.