

AccuTOF-DART™

Clandestine Methamphetamine Labs: Rapid Impurity Profiling by AccuTOF-DART™

Introduction

Methamphetamine is a Schedule II Controlled Substance that is illegally manufactured in clandestine labs. There are several common synthetic pathways in use. For this study, methamphetamine was synthesized from phenyl-2-propanone by the (1) Leuckart synthesis or (2) Reductive Amination, or from ephedrine or pseudoephedrine by the (3) Nagai, (4) Birch, and (5) Edme syntheses. Each of these reaction sequences resulted in unique impurity profiles¹⁻³ that can be used by law enforcement to track the activities of clan labs, distribution networks, and trafficking patterns. The AccuTOF-DART was used to examine the starting materials, reaction mixtures, and final products from each reaction scheme.

Experimental

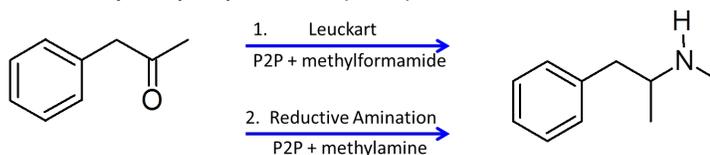
A JEOL AccuTOF-DART mass spectrometer was used for all measurements. Samples were deposited on the sealed end of melting point tubes and measured in positive-ion mode with helium DART gas and a gas heater setting of 350°C. Polyethylene glycol (average MW 600) was used as a reference standard for exact mass measurements.

Results

Examples are given of the DART mass spectra measured for methamphetamine synthesized by the Birch (Figure 2) and Nagai (Figure 3) synthetic methods.

Meth Synthetic Pathways

• Phenyl-2-propanone (P2P)



• Ephedrine/Pseudoephedrine

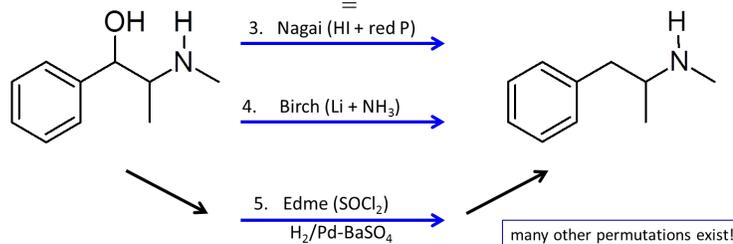


Figure 1. Common synthetic pathways for the illicit manufacture of methamphetamine.

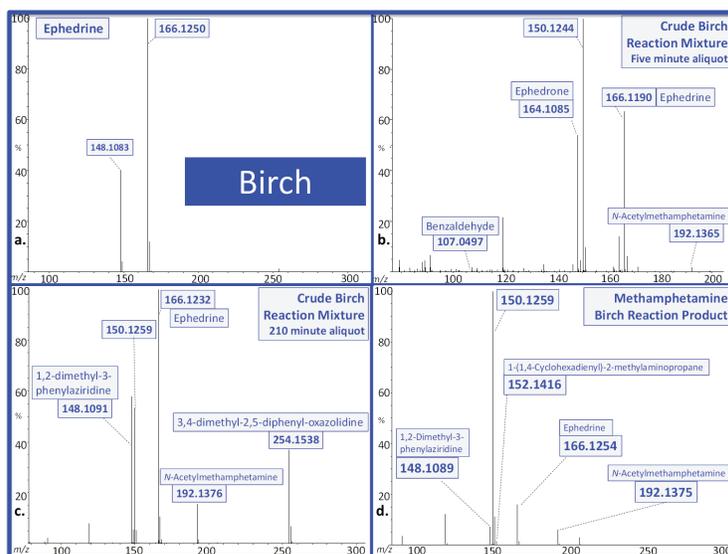


Figure 2. AccuTOF-DART mass spectra for ephedrine, crude reaction mixture at two different reaction times, and the final reaction product of a Birch synthesis.

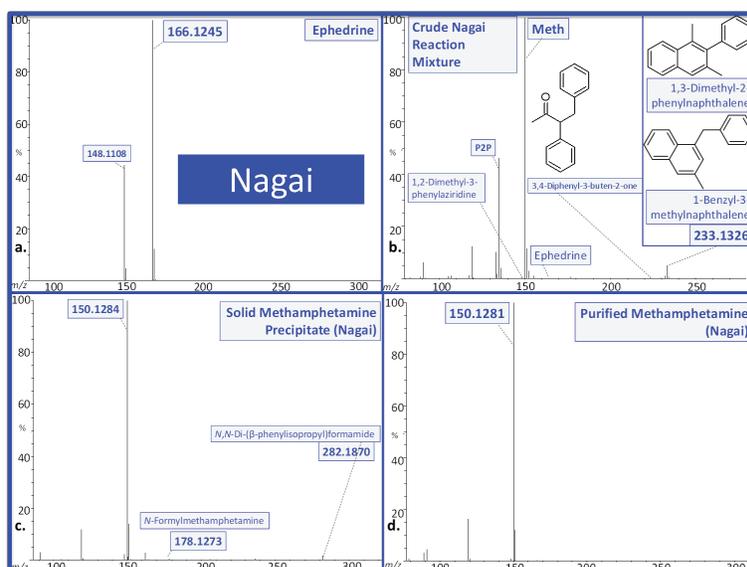


Figure 3. AccuTOF-DART mass spectra for the ephedrine starting material, reaction mixture, methamphetamine precipitate, and purified methamphetamine from a Nagai synthesis.

Conclusion

The AccuTOF-DART can provide rapid impurity profiling that can be used by law enforcement to characterize the starting products, reaction mixtures, and semi-purified final products for methamphetamine manufactured in clandestine laboratories. The results support and complement the alternative GC/MS methods.

Acknowledgement

These data were provided by Prof. Jason Shepard. A more complete discussion of these results for all five reaction methods will be found in a forthcoming publication (reference 4).

References

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