

FORENSIC LITERATURE THESIS

LITERATURE THESIS

Title	: <i>The use of DART-MS in forensic chemistry</i>
Keywords	: Illicit drugs, Trace evidence, Explosives, DART-TOF
Forensic Expertise Area	: <i>Forensic Chemistry, Instrumental Analysis</i>
Department	: Controlled Substances
Institute/Company	: Virginia Department of Forensic Science
Supervisor	: Jennifer Bonetti
Email address	: Jennifer.Bonetti@dfs.virginia.gov
Telephone number	: +1-845-853-4386
UVA Co-assessor	: Arian van Asten
UVA Coordinator	: Arian van Asten/Yorike Hartman

SHORT DESCRIPTION

In 2005, a revolutionary new technique was introduced in which samples could be ionized at ambient atmospheric conditions for the purposes of subsequent high-resolution time-of-flight mass spectrometry analysis¹. This instrumental technique, known as Direct Analysis in Real Time (DART) allows for mass spectral analysis of complex samples with minimal sample preparation, making it an ideal analytical option for a wide range of sample types.

Since its inception, DART has been utilized in multiple forensic chemistry disciplines, including, but not limited to, drug analysis^{2,3}, explosives analysis⁴⁻⁵, trace evidence analysis,⁶ and questioned documents examination⁷. The aim of the literature thesis is to explore the forensic applications of DART-TOF in further detail with particular emphasis on recent advances and improvements.

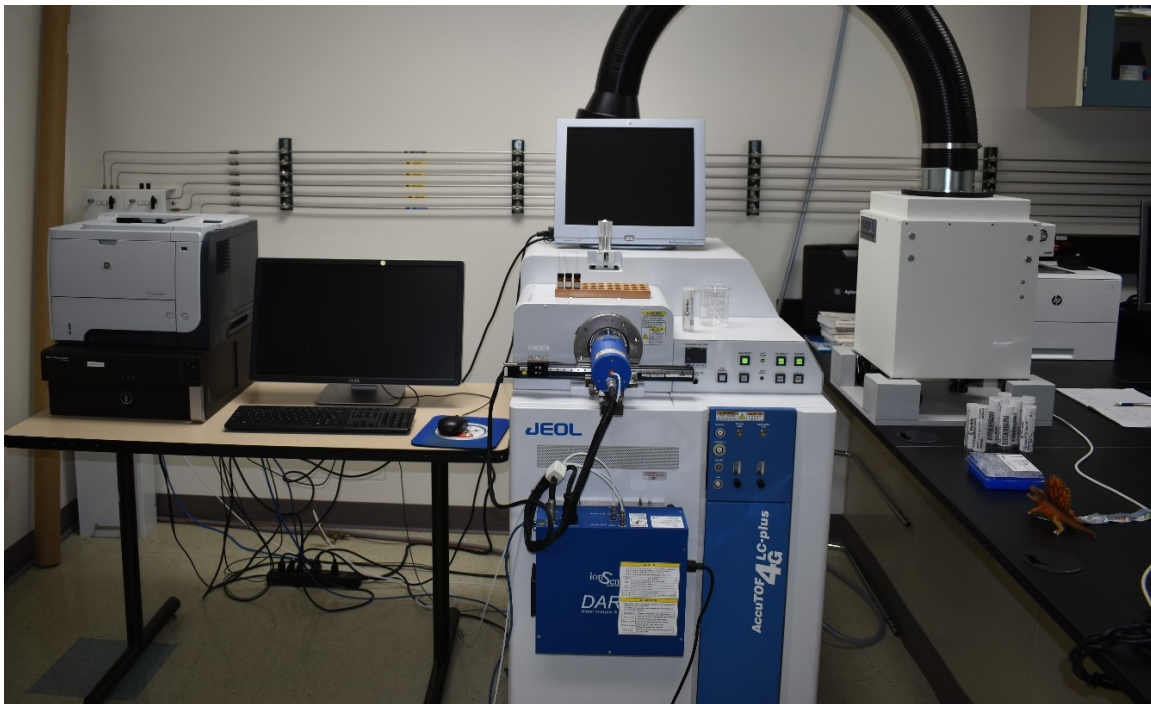
REFERENCES

- 1) Cody, R.B., Laramée, J.A., Durst, H.D. Versatile new ion source for the analysis of materials in open air under ambient conditions. *Analytical Chemistry*, 2005, **77**, 2297-2302.
- 2) Steiner, R.R., Larson, R.L. Validation of the Direct Analysis in Real Time Source for Use in Forensic Drug Screening. *Journal of Forensic Sciences*, 2009, **54**, 617-622.
- 3) Easter, J., Steiner, R.R., Pharmaceutical identifier confirmation via DART-TOF. *Forensic Science International*, 2014, **240**, 9-20.
- 4) Swider, J.R. Optimizing Accu Time-of-Flight/Direct Analysis in Real Time for Explosive Residue Analysis. *Journal of Forensic Sciences*. 2013, **58**, 1601-6.
- 5) Sisco, E., Dake, J., Bridge, C. Screening for trace explosives by AccuTOF-DART® : An in-depth validation study. *Forensic Science International*. 2013, **232**, 160-8.

- 6) Maric, M., Marano, J., Cody, R.B., Bridge, C., DART-MS: A New Analytical Technique for Forensic Paint Analysis. *Analytical Chemistry*, 2018, **90**, 6877-6884.
- 7) Jones, R.W., Cody, R.B., McClelland, J.F.. Differentiating Writing Inks Using Direct Analysis in Real Time Mass Spectrometry. *Journal of Forensic Sciences*. 2006, **51**, 915-8.

REQUIRED/RECOMMENDED EXPERTISE

- Basic understanding in forensic chemistry. Familiarity with time-of-flight mass spectrometry and ambient ionization is recommended.



DART-TOF-MS setup at the Virginia Department of Forensic Science