

Abstracts – Oral Presentations

TUESDAY

KN1 Working Outside of the Box: The Direct Analysis in Real Time (DART) Ion Source

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Ambient, ionization, DART, direct, analysis

New mechanisms and applications of the DART ion source will be presented.

The Direct Analysis in Real Time (DART) ion source [1] was first operated in 2003 and introduced as a commercial product in 2005. DART and desorption electrospray ionization (DESI) [2] were the first of a new generation of atmospheric pressure ion sources and the first “ambient” ion sources. The ability to ionize samples in open air under ambient conditions made it possible to perform many analyses rapidly with minimal sample preparation.

The published mechanisms for DART ion formation are based on Penning ionization of atmospheric gases, followed by proton transfer from protonated water or proton abstraction by O_2^- . These mechanisms suffice for a majority of small molecules. Other reactions can occur, including direct Penning ionization of the analyte and charge transfer from O_2^+ . DART is similar to atmospheric pressure photoionization (APPI) because both molecular ions and protonated molecules can be observed in DART spectra.

Applications of DART include chemical reaction monitoring, natural product characterization, forensic analysis, pharmaceutical analysis, quality control and troubleshooting. Many samples can be analysed directly. Rapid sample preparation techniques such as derivatization and solid-phase microextraction (SPME) can extend the method. Analysis of complex mixtures without prior separation presents challenges. High-resolution and/or tandem mass spectrometry are essential for trace analysis and identifying unknowns. Examples will be presented of applications to real problems.

[1] R. B. Cody, J. A. Laramée, H. D. Durst, *Anal. Chem.* 2005, 77, 2297-2302.

[2] Z. Takats, J. M. Wiseman, B. Gologan, R. G. Cooks, *Science* 2004, 306, 471-473.

[3] D. B. Robb, T. R. Covey, A. P. Bruins, *Anal. Chem.* 2000, 72, 3653-3659.