



Droplet Ion Source for Mass Spectrometry

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WARF: P01365US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an improved TOF mass spectrometer that makes TOF mass spectrometry suitable for a wide range of genomics and proteomics applications.

Overview

Electrospray ionization (ESI) mass spectrometry holds significant potential for selectively, quickly and sensitively analyzing complex mixtures of large molecular weight biomolecules, such as oligonucleotides and proteins. For this to happen, however, three main hurdles must be overcome. First, the charge state distributions of large molecular weight ions generated by ESI must be reduced from multiple to single states, an issue that is addressed by WARF technologies P99352US and P00311US (see links below). Second, the beam of ions generated by ESI tends to spread, causing loss of ions as they travel into and through the mass analyzer and greatly reducing detection sensitivity and resolution. Finally, because ESI produces a continuous stream of ions, rather than discrete packets, or droplets, of ions, it is inherently incompatible with time-of-flight (TOF) mass spectrometry, the most widely used method for detecting large biomolecules.

The Invention

UW-Madison researchers have now developed a new TOF mass spectrometer that uses single charged droplets as ion sources and focuses these droplets, through use of an aerodynamic lens, onto the center axis of the mass analyzer. Discrete ion droplets are produced by ESI through the use of a novel piezoelectric dispenser (see WARF reference number P01294US). The combination of these advances promises to make mass spectrometry suitable to a wide range of previously unattainable applications, including DNA sequencing, protein identification, and quantification of relative protein expression levels.

Applications

- Mass spectrometry for genomics and proteomics

Key Benefits

- Provides vastly increased detection sensitivity, approaching the single molecule level
- Offers enhanced capability for the analysis of complex mixtures and multi-subunit protein complexes
- Ions travel along a single, defined trajectory, resulting in dramatic increases in collection efficiencies (possibly up to 1012-fold)
- Uses minute sample quantities (e.g., 20 picoliters), allowing analysis of liquid samples available in extremely small amounts
- Promises to make TOF mass spectrometry suitable for a wide range of genomics and proteomics applications
- Lens system can be incorporated into existing ESI mass spectrometers, or combined with the inventors' other advances to create the next generation mass spec instruments

Additional Information

For More Information About the Inventors

- [Lloyd Smith](#)

Related Technologies

- [See WARF reference number P00311US for a technology that uses a corona discharge to reduce the charge state of ions generated by electrospray ionization.](#)
- [See WARF reference number P99352US for a technology that uses a polonium alpha particle source to reduce the charge state of ions generated by electrospray ionization.](#)
- [See WARF reference number P01294US for a piezoelectric element that generates discrete droplets of ions in electrospray ionization mass spectrometry.](#)

Tech Fields

- [Analytical Instrumentation, Methods & Materials : Mass spectrometry.](#)
- [Research Tools : Genomics & proteomics](#)

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854