New Method of Charge Reduction in Electrospray Mass Spectrometry

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an improved means to reduce and control the charge states of ions generated by electrospray ionization.

OVERVIEW

Analysis by mass spectrometry requires that molecules first be converted to gas-phase ions. Converting small molecules into ions is straightforward; however, ionizing large molecules, such as DNA, wasn’t possible until the advent of electrospray ionization (ESI) and MALDI (matrix-assisted laser desorption-ionization) techniques. ESI avoids the fragmentation of analyte molecules that occurs with MALDI. But ESI generates ions carrying multiple charges, and the number of possible charge states increases with molecule size, resulting in mass spectra that tend to be extremely complex and difficult to interpret.

THE INVENTION

UW-Madison researchers have developed an improved means to reduce and control the charge states of ions generated by electrospray ionization. They previously developed a technique for reducing the charge state of ions by using a polonium alpha particle source (see WARF reference number P99352US). The technology featured here improves upon the previous one by using a corona discharge to reduce ion charge state distributions. It also allows users to produce gas-phase ions of positive or negative polarity, and which carry either a fixed charge or possess a charge state distribution that varies selectively over time.

APPLICATIONS

• Mass spectrometric analysis of large molecules like DNA

KEY BENEFITS

• Device is simple to make and use
• Can generate ions from many high molecular weight compounds, including peptides, oligonucleotides, carbohydrates, polysaccharides, glycoproteins and lipids
• Offers adjustable control of the sample’s ion charge state distributions
• Ion streams can be negatively charged, positively charged, or both
• Can be coupled to an on-line purification system to perform separation before gas-phase ion formation
• Easily coupled to methods for generating a continuous or pulsed stream of charged droplets for mass spectrometry
• Corona discharge can be placed at any point downstream of the droplet source
• Causes minimal fragmentation of molecules during the ionization process

STAGE OF DEVELOPMENT

Successfully used to analyze a mixture of seven proteins (neurotensin, melittin, glucagon, insulin, ubiquitin, cytochrome c and apomyoglobin), as well as a mixture of seven oligonucleotides of up to 51 base pairs in length.

ADDITIONAL INFORMATION

Related Technologies
See WARF reference number P99352US for the inventors' original method of reducing the charge state of ions by using a polonium alpha particle source.

Tech Fields
Research Tools - Genomics & proteomics
Analytical Instrumentation - Mass spectrometry

CONTACT INFORMATION

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