Ion Focusing Device for the Improvement of Analysis by Mass and Ion Mobility Spectrometries

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Technology description

Series of Ring Electrodes Funnel Incoming Ions Toward Analyzer for Improved Analysis

This device uses interchangeable ring electrodes to improve ion signal to mass spectrometers and ion mobility spectrometers. Mass spectrometry techniques determine the quantity and type of compounds present in a gas sample. Mass spectrometry allows researchers to identify unknown compounds in a sample, revealing important information regarding protein sequences, the study of blood and urine samples in pharmacokinetics, the age of materials in isotope dating, and the composition analysis of samples taken from robots in space exploration. An ion guide can improve the efficiency of introducing ions into a mass or mobility analyzer, but available ion funnels do not operate efficiently at atmospheric pressure. Researchers at the University of Florida have engineered a device that focuses ions at atmospheric pressure before they enter a mass spectrometer or ion mobility spectrometer, which leads to an ion signal that is two orders of magnitude greater than existing technologies.

Technology

This device performs at atmospheric pressure and comprises a series of typically twenty modular ring electrodes that concentrate gaseous ions to enhance ion signal sent to a mass spectrometer or ion mobility spectrometer. Each electrode is connected to a high voltage power supply through a resistor bridge to control the magnitude of voltage applied to each electrode. For optimal ion focus, the electrode ring diameter size begins at 40 mm and exponentially decays to 10 mm while the applied voltage exponentially decays from 4000 V, though the modular nature of the ion guide allows it to be reconfigured for different applications. A mass spectrometer receives the focused ion signal where the various components of the gas sample may be analyzed. The ion signal was shown to improve by two orders of magnitude when this ion guide was employed in conjunction with a FAIMS unit interfaced with a mass spectrometer.

Application area

Enhanced mass spectrometry and ion mobility device for chemical analysis

Advantages

Modular electrodes allow for quick and simple improvement on existing spectrometers, reducing implementation costs
Enhanced ion signal is sent to mass spectrometer or ion mobility spectrometer, improving sensitivity by two orders of magnitude
Easily adjustable DC voltage sent to electrodes, improving sensitivity and resolution of mass and mobility spectrometers
Ion funneling operates under normal atmospheric conditions, not requiring the use of a vacuum

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