Analytical Instrumentation, Methods & Materials


# Space and Time Variant Electric Field Enhancement Improves Accuracy of Mass Spectroscopy for Large Compounds

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a mass spectroscopy technique that uses a dynamic electric field to enhance the accuracy of mass spectrograms.**

## Overview

Mass spectroscopy is an analytical technique used to identify, quantify and characterize unknown compounds based on the elemental masses that make up the compounds. The unknown particles are ionized and then accelerated by an electric field. Since they all have the same charge from ionization, the different velocities that they are accelerated to relate directly to the mass of the particles.

The velocities of the particles that are being characterized are obtained by one of two ways. One way is with a “time-of-flight” detector that measures the velocities by simply tracking the time it takes the particles to travel a certain distance in a “drift region” where the particles have a constant velocity. The other uses a separate electric or magnetic field to separate the particles into curving trajectories based on their masses to provide the velocities after they are identified by a spatial detector.

The biggest problem with these techniques occurs with particles with larger masses. Compared to smaller mass species, the larger ones have significantly lower differences in particle velocities. This poses problems because current detection techniques cannot measure such small differences without increasing acceleration voltages, drift region size or detector size.

## The Invention

UW-Madison researchers have developed a mass spectroscopy technique that uses a dynamic electric field to increase the differences in particle velocity. By making the electric field variable with respect to space and time, particles of different masses experience different charges, allowing for greater differences in velocity. Thus smaller acceleration voltages, drift regions and detector sizes are required.

The electric field gives heavier ion particles less kinetic energy than the lighter particles. This spreads the particle velocities out and enhances the spectrograms of heavier mass species. A computer program then finds the amount of energy gained by each particle and, with the particle velocity, calculates the particle masses. The ability to control the electric field strength in such a way allows for the magnification of the spectrogram axes as well. The user can zoom in on the different peaks and even focus the peaks to reduce their widths. This dramatically increases the versatility of mass spectroscopy.

## Applications

- Mass spectroscopy identification, quantification and characterization of unknown compounds

## Key Benefits

- Enhances spectra of compounds, particularly those with large mass
- Decreases necessary acceleration voltages
- Decreases drift region size
- Decreases detector size

## Additional Information

**For More Information About the Inventors**

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**Tech Fields**

- Analytical Instrumentation, Methods & Materials : Mass spectrometry

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846