

Multiplexed Electrospray Ionization Sources Using Orthogonal Injection into an Electrodynamic Ion Funnel

A new multiplexed electrospray ionization interface significantly boosts mass spectrometry sensitivity and signal-to-noise ratio for improved analysis of ultrasmall samples in analytical chemistry.

Researchers at Purdue University have developed a new approach for multiplexing electrospray ionization sources using orthogonal injection into an electrodynamic ion funnel. Electrospray ionization (ESI) is widely employed as an atmospheric pressure ionization technique in mass spectrometry wherein high voltage is used to generate charged microdroplets from a liquid containing analyte ions. ESI offers several advantages including the ability to analyze a broad range of molecules and compatibility with chromatographic separation. Although mass spectrometry instrumentation is known to be highly sensitive, the sensitivity must be further improved to enable the analysis of ultrasmall samples including single cells. Multiplexing of ESI interfaces is a viable strategy to achieving this goal. However, current ESI technologies that multiplex ion beams still show significant ion loss, which limits their analytical utility. Purdue researchers have created a new multiplexed ESI interface, in which ions generated in multiple independent ESI sources are injected into an electrodynamic ion funnel orthogonally to the instrument axis through multiple heated inlets. Both the total signal and the signal-to-noise ratio increase almost proportionally with the number of inlets. This technique may be used to enhance the performance of any preparative or analytical mass spectrometers. For example, in one application a deposition rate of 20 micrograms of mass-selected ions per day was attained, showing an almost 10-fold increase over the existing systems.

Advantages:

- Increased Analytical Utility in Mass Spectrometry
- Improved Signal-to-Noise Ratio

Technology ID

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Category

Biotechnology & Life
Sciences/Biomarker Discovery &
Diagnostics
Materials Science &
Nanotechnology/Nanomaterial
Characterization & Imaging Tools
Biotechnology & Life
Sciences/Analytical & Diagnostic
Instrumentation

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-High Ion Current

Potential Applications:

-Mass Spectrometry

-Analytical Chemistry

Technology Validation:

The new multiplexed ESI interface for mass spectrometry has been evaluated using a broad range of analytes. Voltage gradients and pressure in the ion funnel have been optimized to obtain the best performance.

TRL: 3

Intellectual Property:

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