INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

System for Electrospray and Nanospray Ionization of Discrete Samples in Droplet Format

Technology number: 4419

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4419

Category
Chemical Processes and Synthesis

Further information
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OVERVIEW

High-throughput analysis of nanoliter samples in gas-segmented droplets

- Enables high-throughput, label-free, direct mass spectrometry analysis
- Permits high-throughput screening, proteomics, metabolomics, clinical diagnostics

BACKGROUND

High-throughput analysis of minuscule sample volumes is a critical need across various scientific fields, including drug discovery, clinical diagnostics, and molecular biology. Traditional methods often rely on labeling or chemical modifications, which can introduce artifacts and limit the types of samples that can be analyzed. The use of segmented flows, where reactions and assays are compartmentalized within droplets or plugs, has led to significant advancements in sample manipulation. These methods allow for complex operations like mixing, diluting, and concentrating within microfluidic devices. However, existing technologies have limitations in analyzing the contents of these tiny compartments directly. An efficient, high-throughput, and label-free method for sample introduction and analysis would significantly advance research and diagnostic capabilities.

INNOVATION

Researchers have developed a novel method to analyze nanoliter or smaller samples stored as gas-segmented plugs or droplets. These samples can be created or stored within a capillary tube or microfluidic device and pumped directly into an electrospray tip, enabling sequential ionization and mass spectrometry analysis. This approach eliminates the need for labeling or chemical modification, providing detailed chemical information such as molecular weight directly from the mass spectrometer. The system accommodates small sample volumes and offers high throughput, making it ideal for diverse applications. Real-world applications include high-throughput screening, proteomics, metabolomics, clinical diagnostics, and process analysis, offering a transformative tool for scientific and medical research.