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Fabrication of 3-D Ion Optics Assemblies by Metallization of Non-Conductive Substrates

Researchers at the University of South Florida have devised a new technique for building ion optics for mass spectrometers and other ion/electron beam instruments from non-conductive substrates coated at specified areas with conductive layers.

In-situ sensors enable researchers to investigate real-time chemical dynamics in the environment, thereby greatly improving sampling densities and providing the capability for autonomous measurements in harsh environments. Recent efforts in extreme miniaturization of mass spectrometers and their components have been stimulated by opportunities arising from micro-fabrication techniques and advances in materials sciences. Previous attempts have focused on micro-fabrication of as many as a million micron-sized cylindrical ion trap (CIT) mass spectrometer arrays on silicon wafers. While an array-based approach for MS miniaturization can be useful to compensate for the reduced signal intensities that result from miniaturization of each mass spectrometer, affordable batch fabrication of such arrays remains a challenge.

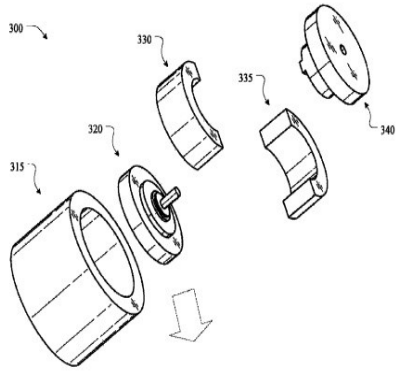
The current invention includes, in one embodiment, a method to simplify the fabrication and assembly of cylindrical ion traps (CITs) using new materials and processes. Accordingly, a CIT was made from Low Temperature Co-fired Ceramics (LTCC), used in semi-conductor industry as a packaging material and physical MEMS and RF (MEMS) devices. The invention seemed to improve the precision of the conducting layers while on the other hand reducing the complexity involved during the fabrication of devices regardless of whether the substrate layer is conductive or otherwise. The invention also has the ability to control the patterning of the conductive layer.

This invention is applicable for ion optics and any E-Beam instruments which are used for the fabrication of semiconductor devices.

ADVANTAGES:

- **Improved precision of conducting layers**
- **Less complexity in its fabrication**
- **Controlled patterning of the conductive layer**
- **Lesser expense and processing time**

Breakthrough for Fabrication Industry!!



A schematic to define the terminology used to describe the dimensions of cylindrical ion traps (CITs).

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