UNIVERSITY OF RHODE ISLAND

Department of Chemistry

SEMINAR

Room 234 Pastore Hall

3:00 p.m, Wednesday, March 16, 2016

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URI

"Ion Sponge: A Novel Approach to Trap, Eject, and Analyze Charged Species"

HOST

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Abstract: As with the introduction of portable computers many applications in science that were out of the realm of possibilities before became an ordinary occurrence, making new inventions important for driving research forward. Trapping ions in a gas phase and studying their behavior was one of the goals that scientists envisioned would help them to understand chemical reactions. One of the techniques used for such applications is a quadrupole ion trap that allows a certain range of ions being trapped at the same time in a confined space. High voltage is applied to electrodes, creating a magnetic field of certain magnitude. The limitations associated with this method are space charge effects from multiple ions trapped and being repelled from each other, and the voltage that should be applied in order to create a magnetic field of large enough magnitude. To overcome these drawbacks a new device called "ion sponge" was proposed that consists of 3D arrays composed of a total of 484 ion trap units. It consists of multiple layers, which gives it extended versatility compared to traditional quadrupole ion traps. Namely the ability to trap ions in one layer and fragment them, and then through inter-layer transfer trap the fragments in a separate layer enhancing the signal. Another application comes from the ability to trap ions of different m/z values at the same time in different areas of the ion sponge and collect the spectra of them, as well as perform fragmentation and characterization experiments at the same time. The concept was verified using multiple molecules with different functionalities and a range of molecular masses. The advantage in the amount of ions trapped is somewhat offset by the mass resolution currently being at ~2 amu. However, the ability to perform different experiments at the same time in various sections of the device have promising applications in the future, especially since it was shown that resolution improves with certain geometries and more precise machining.

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