Ion Traps & Other Technologies that Brought Miniature Mass Spectrometers Mainstream

Ion Trap Interest Group

70th ASMS Conference on Mass Spectrometry and Allied Topics

Tuesday, June 7, 2022

Presiding: Dalton Snyder (Teledyne FLIR); Theresa Evans-Nguyen (USF)

Speakers/Panelists:

Jason Bu, PURSPEC
Shawn Johnson, PerkinElmer
Kenion Blakeman, 908 Devices
Krisztian Torma, Bayspec
Mark Osgood, former employee of Excellims
Vladimir Doroshenko, MassTech
Miriam Fico, former employee of Smiths Detection & Griffin (FLIR)

Attendance: ~60 (room was filled)

Format: ~5 min flash talks followed by ~25 min panel discussion with audience Q & A

Following the previous two ion trap workshops focused on space science and high mass trapping/detection (mostly academic presenters), this year's focus was highlighting the commercial successes of miniature/portable ion trap mass spectrometry and reviewing the technologies that 'made it' to market.

Jason Bu discussed a new generation of ambient ionization ion trap mass spectrometer (termed 'Cell') being developed by PURSPEC and potential clinical applications (e.g. morphine screening in urine, detection of drugs in whole blood). Shawn Johnson discussed recent work at PerkinElmer for improving the toroidal ion trap geometry. Kenion Blakeman (908 Devices) presented high-pressure mass spectrometry technology being coupled with capillary electrophoresis for amino acid detection. Krisztian Torma from Bayspec mentioned several technologies key to two commercial miniature mass spectrometers, from the hyperbolic linear ion trap with MS/MS to a custom 3-chamber vacuum system design. Mark Osgood, formerly of Excellims, highlighted how high-performance ion mobility could be successfully coupled to a linear ion trap in a small form-factor mass spectrometer. Vladimir Doroshenko of MassTech showed instrument diagrams and subsystems of a new MT Explorer 30 and highlighted the challenges of ion transmission and gas load in such a small system. Finally, Miriam Fico, a former employee of Smiths Detection and Griffin (now Teledyne FLIR) highlighted important system considerations for portable mass spectrometers, namely simple user interfaces, size, weight, power, robustness, and simple sample preparation, and how new advancements (such as improvement to battery technologies) are positively impacting the field.

The evening concluded with a ~25-minute panel discussion with our speakers. A primary point of discussion was whether miniature mass spectrometers were set to make breakthroughs into

markets beyond defense/first responders, particularly clinical diagnostics and healthcare. Some participants argued that the market was large enough to justify entry into this area but there were also significant doubts about commercial viability because of the significant initial investment required and whether the R & D costs could be recouped through sales, even if support was furnished by NIH (or other government means). A second point of discussion was whether highly simplified user interfaces were necessary or if users could be properly trained to handle more complex data collection and analysis tasks instead of receiving a simple yes/no alarm from a largely automated mini MS platform.