Development of a Low Cost Miniature Mass Spectrometer

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There exists a need to monitor several gases simultaneously in a wide variety of environments. These applications require several chemical detectors or a single monitor that can detect all the species of interest. Mass spectrometers are such universal detectors, but they have traditionally been a high cost, large platform solution. Our goal is to use new design and manufacturing technology to reduce the cost and size of MS solutions such that the units become portable and disposable. We rely on experience and computer modeling (Simion, Ansys) to generate viable designs and then prototype and test worthy candidates on the laboratory bench. Three criteria for pursuing any design are 1) acceptable performance for market application, 2) manufacturability, and 3) an appropriate communications interface.

We have built a 200 amu unit based on a design pioneered by Diaz, Gentry, and Giese and licensed from the University of Minnesota. Our first commercial protoype, an 80 amu unit is due for test in mid-April. Our goal for both of these units is to reduce the cost of the core package (source, analyzer, and detector) to around $500. This target would make the units disposable or recyclable and thus eliminate troubleshooting in favor of replacement. We plan to achieve this using currently available mass production technology (e.g., lithography).

Our plans for communications are based on a platform independent, open information architecture where a user can communicate with the sensor from anywhere at anytime. An embedded controller will run the instrument and deliver data over any internet-based infrastructure, wired or wireless, with a browser-based user interface. The internet access will employ TCP/IP/Ethernet, which is fast becoming a standard for information management. In addition the controller will also support an RS232/485 mode for handling industry specific protocols (e.g., FieldBus, ModBus, DevNet). Thus, a user with internet access will be able to communicate with a network of remotely deployed sensors from anywhere at anytime.