Miniaturization of Chemical Measurement Technology

For the contributed session organized by Gary M. Hieftje and Gary Horlick, to honor Prof. Howard Malmstadt

Howard Malmstadt is certainly one of the pioneers who brought about the marriage of modern electronics with chemical instrumentation. I had the good fortune to work for one of his protégés, Gary Hieftje, who also instilled an interest in chemical measurement instrumentation in me. My colleagues and I have been working on the notion of microfabricating devices that perform chemical and biochemical measurements for more than 15 years. The original concept was to replace chemical sensors with chemical instruments by making the tools that we use in the laboratory small enough to pass for sensors. Fortunately, many additional benefits have accrued from these efforts to miniaturize chemical measurement systems. Microfluidics systems have allowed assays to be performed on samples that are four to six orders of magnitude smaller in volume than conventional scale while providing answers one-hundred times faster, and all at low cost. Moreover, the reproducibility of experimental results has improved. We are now seeing similar benefits from mass spectrometry and ion mobility devices that have been shrunk in length scale by an order of magnitude. This presentation will provide an overview of our latest results in the area of miniaturized chemical instrumentation.

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