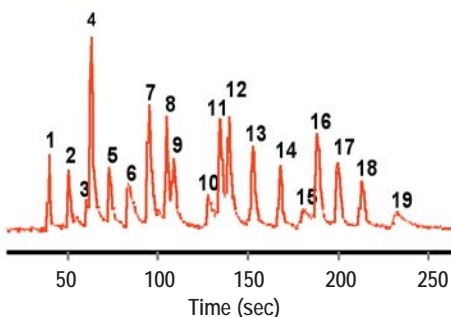
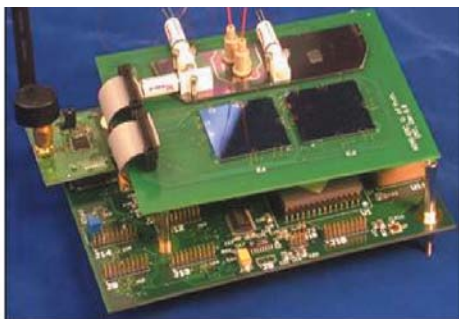


Complex Mixture Analysis With a Wireless Microsystem

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Determining the composition of complex mixtures of gases and vapors *in situ* is critically important to effective security screening, human and ecological exposure assessment, industrial emission monitoring, and biomedical surveillance and diagnosis. The WIMS micro-GC (μ GC) is a low-power integrated microsystem designed to meet the needs of all such applications. Representing the culmination of several years of work, the μ GC combines the following components, all made using MEMS technologies: a sample inlet with particulate filter, passive calibration vapor source, multi-stage preconcentrator/focuser (μ PCF), dual-column separation module with pressure- and temperature-programmed separation tuning, an array of microsensors for analyte recognition and quantification, and system pressure and temperature sensors. Flow is provided by a miniature off-substrate pump. This year, we have succeeded in integrating fluidic, electronic, and RF-wireless subsystems in a hybrid prototype and performing rapid, high-quality analyses of multi-vapor mixtures. The prototype system (upper left) was used to analyze a mixture of 19 indoor air contaminants of anthropogenic and microbial origin in just under 4 minutes (see single-detector chromatogram at lower left). Drawing on the collective expertise of students and faculty from numerous disciplines across several departments and universities, this effort epitomizes the type of multi-disciplinary research made possible by ERC funding. This integrated microsystem has garnered active interest from numerous governmental and private-sector organizations seeking to license the technology or engage in collaborative, application-specific development projects, or both. ■