Bilkent EEE Distinguished Seminar Series

Bilkent University - Department of Electrical and Electronics Engineering

Gas-phase microfluidic systems meet real-world practical applications: collecting, separating, identifying, and quantifying volatile organic compounds at the chip scale

Prof. Yogesh B. Gianchandani

University of Michigan, Ann Arbor

Tuesday, May 05, 2026 – 15:30 (EE-01)

https://bit.ly/BilEEESem260505

Volatile organic compounds (VOCs) such as benzene, toluene, and xylene are common pollutants found in fugitive emissions from industrial processing; from the refinement, distribution, and combustion of petroleum and oil; and from printing and painting. Elevated exposure to such VOCs can result in central nervous system dysfunction, respiratory and cardiovascular diseases, and cancer. There is an obvious need to monitor and regulate such emissions in a cost-effective manner. I will selectively review the nearly 50-year trajectory of research directed at micro-gas chromatographs for collecting, separating, identifying, and quantifying VOCs. New architectural options which are highly effective make better use of microfabricated elements than what is possible with conventional configurations. Results from advanced prototypes and recently commercialized micro-GCs show robust operation, with limits of detection that are better than 1 ppb for a number of VOCs – even while using ambient air as the carrier gas. Some of these microsystems incorporate more than 15 microfluidic elements on a single chip. However, in all cases the pumps are physically separate elements, which begs the question: is it possible to have a single-chip monolithic gas chromatograph that incorporates all the essential gas phase fluidics, including pumps?

This research is conducted within the University of Michigan Center for Wireless Integrated MicroSensing and Systems (WIMS^2). The Center brings together research in multiple specialties to facilitate microsystems for healthcare and environmental monitoring.

Bio: Yogesh B. Gianchandani is a Professor in the College of Engineering at the University of Michigan, Ann Arbor. Since 2010, Dr. Gianchandani has served as the Director for the UM Center for Wireless Integrated MicroSensing and Systems (umwims2.org). He previously served at the National Science Foundation as the Program Director for Micro and Nano Systems in the Engineering Directorate. He is a co-founder of Omniscent, Inc., which develops high-performance microfabricated sensors for monitoring volatile organic compounds in ambient air. He is also a co-founder of Earth Wind Micro, and Exosome Plus.Dr. Gianchandani's research interests include microsystems for environmental monitoring and healthcare (web.eecs.umich.edu/~yogesh/). He has graduated 49 doctoral students, and together with his research team members he has contributed to more than 55 issued or pending US patents, as well as about 375 papers in journals and conferences. He is the Chief Editor of *Comprehensive Microsystems: 2nd edition*, a 3-volume book series published by Elsevier in 2025. Dr. Gianchandani is an IEEE Fellow.