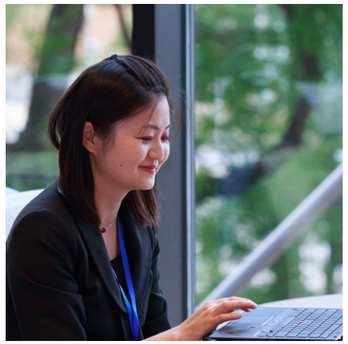
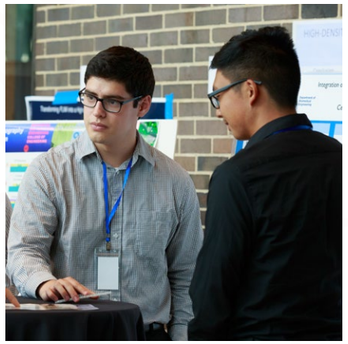
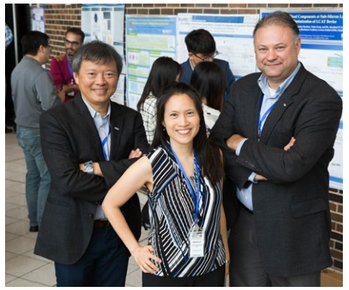
CADMIM

Center for Advanced Design and Manufacturing of Integrated Microfluidics







Pictured (left to right)

Abe Lee: the William J. Link Professor and chair of biomedical engineering at the University of California, Irvine and leader of the UC-Irvine CADMIM site

Gisela Lin: Center Deputy Director at the University of California, Irvine

Ian Papautsky: the Richard and Loan Hill Professor of Bioengineering in the UIC College of Engineering and leader of the UIC CADMIM site

Event Photography Credit: Elizabeth Monge

Find out more about CADMIM

inrf.uci.edu/cadmim

The Center for Advanced Design and Manufacturing of Integrated Microfluidics (CADMIM) is a National Science Foundation (NSF) Industry/ University Cooperative Research Center (I/UCRC).

CADMIM's vision is to advance cutting-edge research and education of integrated microfluidics, the science manipulating fluids at the submillimeter scale. The Center acts as a bridge between academia and industry by working closely with industrial members and developing applied research projects that can address bottlenecks in their business spaces and workflows.

The CADMIM mission is to microscale tools and technologies aimed at simpler, faster, and cheaper analytical solutions addressing human health, agriculture, and the environment. The strategy for this grand challenge centers on mass-produced diagnostic devices containing miniature microfluidic components with high sensitivities (nM-pM) and short reaction times (<1min), capable of bioanalysis in miniaturized volumes (μL-pL).

Despite the many academic laboratory advances to date, few microfluidic systems have comprehensive sample-to-answer capability. The few extant commercial microfluidic systems are expensive ($1000s to $100,000s), typically consisting of a disposable chip with limited functionality that relies on a customized external "reader" (handheld or benchtop) in order to obtain meaningful data. What does not yet exist are mass-produced, cost-effective lab-on-a-chip (LOC) platforms that integrate components to carry out multiple microfluidic/ diagnostic functions and report results via a standard communications device.

Innovation is needed on two related fronts: (a) employing and/or modifying existing scalable processes make microfluidic devices, and (b) designing LOCs that are amenable to mass production. CADMIM research efforts thus focus on three main areas: manufacturable processes and materials, fluid sample processing and detection, and integration and control systems. These areas of investigation lay the foundation for broader commercialization of microfluidics in application areas ranging from medical diagnostics and pharmaceutics to water and food quality assessments to household products.

CADMIM spans two sites: University of Illinois at Chicago (UIC) and University of California, Irvine (UCI)

In Phase 1, the sites have worked together with the CADMIM industrial members toward creating an innovative ecosystem that provides a rich environment for the development of scalable, industrially relevant integrated LOCs, strategic partnerships that facilitate technology translation, and the next generation of workers skilled in multidisciplinary applied science. With this Phase 2 award from NSF, totalling $1.25M across both sites, CADMIM will continue its mission to engage more industry partners and work with them to advance microfluidics technology and develop solutions to their needs.

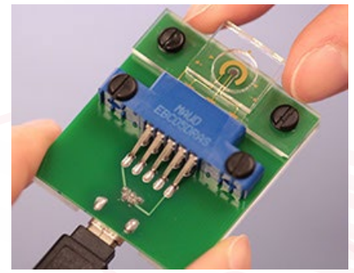
News from Papautsky Lab

Papautsky Developing Finger-Prick Blood Test for Toxic Metals

Metals are ubiquitous in the environment and have long been recognized to pose significant threats to human health. Blood lead has been consistently associated with deficits in IQ and academic achievement. Manganese is an essential element, yet neurotoxic in excess, capable of accumulating in the brain. Both metals are often discharged to the environment by industrial activities or manufacturing plants, while manganese is also a naturally occurring trace metal commonly found in the environment.

Current approaches for measuring such exposures suffer from high costs and time-consuming laboratory procedures. Hence, there is a critical need for improved technology to quantitatively assess levels and identify adverse consequences of these exposures. A three-year, $1.8 million grant from the National Institutes of Health will enable Ian Papautsky, the Richard and Loan Hill Professor of Bioengineering in the UIC College of Engineering, and his collaborators to develop portable, easy-to-use sensors that can detect these neurotoxic metals in a single drop of blood.

The approach will integrate several parts needed for the sensors: the chip on which sample is placed, the equipment that sends current through the chip to detect the metal, the software to process the results, and the user interface that displays the results. The goal is for the sensor system to be easy for anyone to use, and the results easy to interpret. The sensor will also be validated by comparing results of blood tests from 150 children recruited from Chicago neighborhoods known to be affected by environmental manganese, to results obtained from matching blood samples sent to a traditional lab for processing. The ultimate goal of this work is to use sensors to move blood analysis from the laboratory to the clinical setting, providing results within minutes.



Find out more about Papautsky Lab, including latest news and research projects

papautsky.lab.uic.edu

Papautsky and his new invention were featured in a story on WTTW's Chicago Tonight website. Read more here

news.wttw.com