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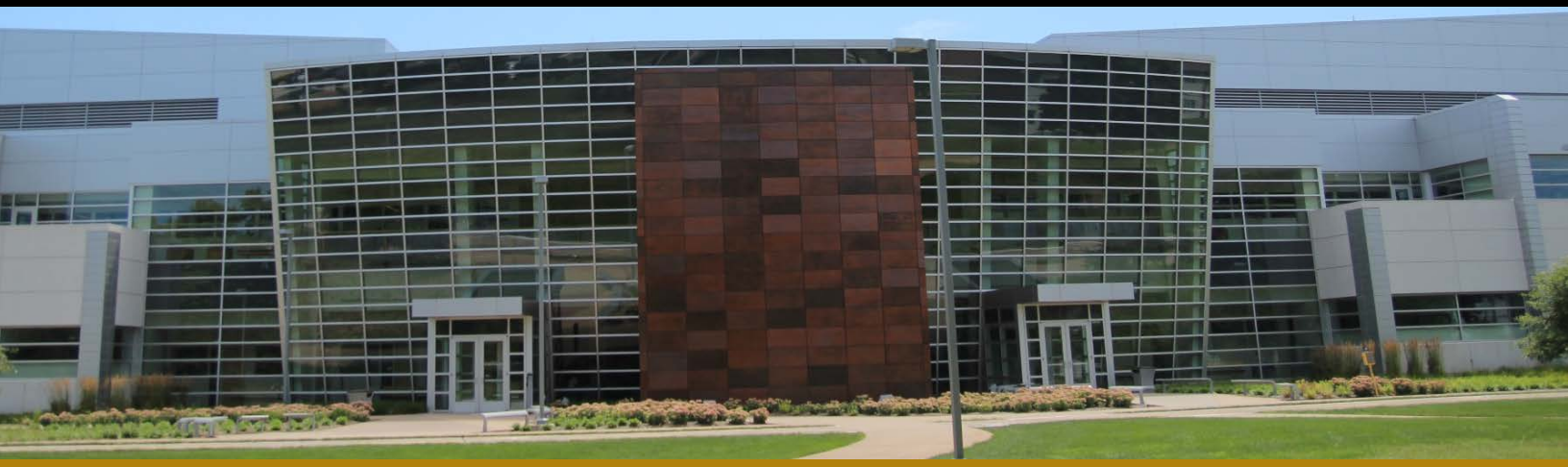

Birck Nanotechnology Center

Birck Center Seminar

Dr. Muhammad Mustafa Hussain

Softening Hard CMOS Electronics through Manufacturable Heterogeneous Integration

Monday, March 5th, 2018
9:30am – 10:30am , BRK 1001

Bio: Mustafa (PhD, ECE, UT Austin, Dec 2005) is a Professor of Electrical Engineering, KAUST. He was Program Manager in SEMATECH (2008-2009) and Process Integration Lead for 22 nm node FinFET CMOS in Texas Instruments (2006-2008). His research is focused on futuristic electronics which has received support from DARPA, Boeing, Lockheed Martin, GSK-Novartis and SABIC. He has authored 300+ research papers and patents. His students are serving as researchers in MIT, Caltech, UC Berkeley, Harvard, UCLA, TSMC, and DOW Chemicals. He is a Fellow of American Physical Society and Institute of Physics, a distinguished lecturer of IEEE Electron Devices Society, and an Editor of IEEE T-ED.

Abstract: We live in the age of information where electronics play critical role in our daily life. Moore's Law: performance over cost has inspired innovation in complementary metal oxide semiconductor (CMOS) technology enabled high performance, ultra-scaled CMOS electronics. Moving forward as Internet of Everything (IoE) seamlessly connects people, process, device and data – can CMOS technology be expanded further to achieve new features in CMOS electronics while maintaining and/or strengthening existing attributes? Will the functionalities over cost be advantageous? Can the existing applications be further strengthened and/or diversified? What potential applications may emerge?

To address these questions, I will discuss rational design of materials, processes and devices to develop robust manufacturing processes through heterogeneous integration of state-of-the-art CMOS technologies to transform conventional high performance but rigid CMOS electronics into fully compliant one; various printing techniques (inkjet for interconnects, 3D printing for encapsulation); electrochemical deposition (ECD) for through polymer via (TPV); automated transfer; Lego like lock and key assembly; non-functionalized household papers and other responsive materials based sensors and actuators, respectively and finally their roll-to-roll processing to achieve nature inspired fully compliant in-plane and out-of-plane CMOS electronics for emerging IoE applications.

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