TEXAS TECH UNIVERSITY
Department of Mechanical Engineering

Electrowetting-on-dielectric (EWOD) Digital Microfluidics and Its Applications

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Abstract: In this seminar, the speaker will introduce concept of digital microfluidics and its broad applications including biomedical and chemical analysis applications and thermal management of electronics. Since the advent of microelectromechanical systems (MEMS), many microfluidic devices have been studied and developed to handle fluids on the microscale. In these devices, numerous actuation methods have been introduced to pump and regulate fluids: piezoelectric, electrostatic, thermopneumatic, electrophoretic, shape memory alloy, and so on. Most of these devices, however, only can handle the continuous flows. Handling of digitized liquid segments has many advantages in real world applications such as a lab-on-a-chip. The most distinctive feature of digital microfluidics is the capability to form fluids compartments, which enables the multiplexing processes in various bio- and chemical sample preparations. Among several viable ways to digitize fluids into droplet format, using surface tension changes by electric field application will be discussed. Recently, surface tension has caught researchers' attention in MEMS field due to its dominance in small scale. Electrowetting (EW) is the phenomenon of surface tension modulation at the interface of liquid and solid due to the external electric field. The speaker will demonstrate the new concept of controlling fluids with EW and development of digital microfluidic circuits. The completion of fundamental fluidic operations using surface tension will be presented. Successful applications of the digital microfluidic device to the biology and analytical chemistry fields as well as heat transfer problem will be presented.

Bio: Dr. Hyejin Moon is Associate Professor and the director of Integrated Micro and Nanofluidics laboratory (IMNfL) of Mechanical and Aerospace Engineering Department at University of Texas at Arlington (UTA). She received her Ph.D. from Mechanical Engineering at University of California, Los Angeles (UCLA) in 2005, followed by Postdoctoral research experience at School of Dentistry and School of Engineering at UCLA for 1.5 years. Before she joined UCLA, she received B.S with Cum Laude and M.S. degree from Chemical Engineering at Sogang University, Seoul, Korea in 1995 and 1997, respectively, and worked as process control engineer for Honeywell-Korea, Co. Ltd. For 3 years. Her research interest includes interfacial science, surface phenomena, electrohydrodynamics, microfluidics, micro total analysis systems (μTAS), bioMEMS/NEMS, microscale heat transfer and nanotechnology. Her research has been funded by National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), National Institute of Health (NIH) and Bill and Melinda Gates Foundation.

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