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An impedance biosensor for rapid detection of low concentration of *Escherichia coli* O157:H7

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This talk will provide a brief introduction of biosensor development followed by the research in our group related to the design, fabrication and testing of impedance based biosensor for rapid detection of *Escherichia coli* O157:H7 with low concentration. The performance of the devices was excellent as evidenced by the focusing capability, high sensitivity and rapid turnaround time of 2 hours. The biosensor has the following innovative features: A focusing region to generate p-DEP(Dielectrophoresis) force to concentrate the bacteria into the center of the microchannel and direct them towards the sensing microchannel which has a diameter smaller than one third of the first channel while the bulk fluid exits from the outer channel; a region for cell trapping that surrounds the detection electrode and uses vertical electrode pairs to generate negative DEP forces pushing the cells toward the region of low E field gradient on top of the detection electrodes. Thus, they trap and facilitate the contact and binding of antigens with the *E. coli* antibody; and bacteria sensing region consists of inter digitated electrode arrays (IDEA) with varying number of fingers coated with anti *E. coli* antibody. As *E. coli* reaches the sensing region it binds to the antibody on IDEA surface and results in impedance change. Fabrication of the biosensor was performed on a glass substrate using SU8 negative photoresist to form the microchannel, gold electroplating to form the vertical focusing electrode pair, thin gold film to form the detection electrode, the finger electrodes, traces and bonding pads and PDMS to seal the device. Various low concentration *E. coli* samples were tested without the trapping electrodes to determine the sensitivity of the biosensor and the lowest detection limit of the biosensor was found to be 39CFU/ml in total turnaround time of 2 hours. We will also report the pathogens detecting while using both the focusing and trapping regions.

Biography

Mahmoud Almasri has received his PhD in Electrical Engineering from Southern Methodist University Dallas, USA. He is currently an Associate Professor in the Department of Electrical and Computer Engineering at University of Missouri. He was with General Monitors, CA as a Research Scientist, then, with Albany nanotech, NY as a Postdoctoral Research Associate and with Georgia Institute of Technology as a Postdoctoral fellow. His current research includes biosensors, MEMS power harvester, IR material and detectors, MEMS Coulter counter. He is Senior IEEE Member.

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