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Interdigitated microelectrode-based impedance sensors for E-coli detection

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Diseases caused by *Escherichia coli (E-coli)* have been a serious threat to public health and food safety for decades and remain one of the major concerns of our society. The urinary tract is the most common site of E-coli infection, and more than 90% of all uncomplicated urinary tract infections (UTI) are caused by *E-coli* infection. Diagnosing UTI usually relies on conventional detection methods (bacteria culture) which are time consuming and labor-intensive. Although more rapid detection methods are available, such as dip-stick method for *E-coli* detection, they provide insufficient sensitivity. In this study, rapid detection of *E-coli* in urine is carried out by impedance measurement using gold interdigitated microelectrodes (IDME) with enhanced sensitivity. Our interdigitated microelectrode sensor is designed with gold surface area of about 0.4 mm^2, since lower detection limits can be achieved by this small electrode area. The stability of the sensors under AC electric field is characterized by measuring capacitance in air and by measuring impedance in phosphate buffer solution (PBS). The capacitance of the sensors measured in air at 100 mV is 2.8 pF with 8 % coefficient of variation, and also the capacitance remains same in the frequency range of 500 Hz to 1 MHz. As electrode features become smaller, the sensitivity of the system is enhanced because the impedance changes are increased. Using this approach, low concentration detection would be possible. The aim of this study was focused on wide range detection from low to high concentration in urine and to optimize the lower detection limit of *E-coli* in urine suspension. This impedance detection technique with gold interdigitated microelectrode shows promising potential for application in UTI diagnosis. This technique can also be applied for the detection of *E-coli* in contaminated food and water samples.

Biography

C.J. Chen is currently having postdoctoral studies in National Central University. She also be an part time assistant professor of Computer Science and Communication Engineering Department in Army Academy of the ROC, Jung-Li City, Taiwan. She received her PhD degree in 2009 of National Central University majoring in Electrical Engineering, Taiwan. She received her BS degree in 2002 and MS degree in 2004 from I-Shou University, Taiwan. Her current research work has been mainly focused on biosensors, bioimpedance field and biomaterials.

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