

Development of Rapid Detection Technique for Pathogens using Nanorod-based Sensor

Yao-wen Huang¹, Yiping Zhao² and William Kisaalita³

¹Department of Food Science and Technology, ² Department of Physics and Astronomy, and

³Department of Biological and Agricultural Engineering, University of Georgia, Athens, GA
30602

The biosecurity and safety of the food and water supply are a serious concern. Novel solutions are required for the development of rapid, reliable, and highly sensitive biosensors for the detection of low level of pathogens in food and water. Development of both the quartz crystal microbalance (QCM) and a nanoparticle-based bioassay technique for detection of *E. coli* O157:H7 and the bio-functional Au/Si nanorods for detection of Respiratory Syncytial Virus (RSV) were investigated. For *E. coli* study, the antibodies were immobilized onto gold electrodes of a QCM using a method based on self-assembled monolayer (SAM). The binding of *E. coli* cells onto the immobilized antibodies decreased the crystal resonant frequency. The difference on frequency between the baseline of phosphate buffered saline (PBS) and adjacent stable line of injected sample was calculated. It indicated that QCM might be a potential for detecting a low level of *E. coli* O157:H7. By using nanoparticle bioassay technique, *E. coli* cells were firstly treated with lysozyme, then incubated with Hoechst 33258, and finally incubated with antibody-conjugated nanoparticles. A high intensity of fluorescence light produced by the nanoparticles could be observed using a fluorescence microscope. For RSV infected cells study, the Si nanorods were firstly fabricated by glancing angle deposition method and the Au was sputtered onto Si nanorods. Dye was immobilized onto the annealed Si nanorods, while antibody of RSV was annealed to Au. Enhanced fluorescence signal produced by attached dye molecules ensured a potential technique for detection of virus.