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Detection and identification of microorganisms by nanoparticles based biosensors

Sam F Y Li and Haiyan Li

National University of Singapore, Singapore

When self-assembled monolayer (SAM) by 11-Mercaptoundecanoic acid (MUA) and AuNPs were used to modify the sensor surface and to amplify the signals, quartz microbalance (QCM) immunosensors showed good detection sensitivity, i.e., detection limit as low as 10^2 CFU/mL for *E. coli* in less than 30 min could be achieved. Though the modification process on the sensor surface still involved several steps, the immobilization process could be readily replaced by easy regeneration of antibodies immobilized sensor surface. $\text{Fe}_2\text{O}_3/\text{Au}$ core/shell nanoparticles were fabricated to improve surface functionality and reduce surface oxidization of iron oxide. By using SAMs with MUA and functionalized $\text{Fe}_2\text{O}_3/\text{Au}$ nanoparticles, an improved QCM biosensor with detection limit of 10^2 CFU/mL for bacteria detection could be obtained. The detection sensitivity of QCM biosensor with $\text{Fe}_2\text{O}_3/\text{Au}$ nanoparticles can potentially be improved after further optimizing of $\text{Fe}_2\text{O}_3/\text{Au}$ nanoparticles.

chmlifys@nus.edu.sg