



Impedance and Field-Effect based Sensors for Medical and Environmental Applications

Speaker: Pedro Estrela

While pathogenic bacteria contribute to a large number of globally important diseases and infections, current clinical diagnosis is based on processes that often involve culturing which can be time-consuming. Therefore, innovative, simple, rapid and low-cost solutions to effectively reduce the burden of bacterial infections are urgently needed. Here we demonstrate a label-free sensor for fast bacterial detection based on metal–oxide–semiconductor field-effect transistors (MOSFETs). The electric charge of bacteria binding to the glycosylated gates of a MOSFET enables quantification in a straightforward manner. We show that the limit of quantitation is 1.9×10^5 CFU/mL with this simple device, which is more than 10,000-times lower than is achieved with electrochemical impedance spectroscopy (EIS) and matrix-assisted laser desorption ionisation time-of-flight mass spectrometry (MALDI-ToF) on the same modified surfaces. Moreover, the measurements are extremely fast and the sensor can be mass produced at trivial cost as a tool for initial screening of pathogens.