Non-faradaic Unlabeled Electrochemical Capacitive Detection of DNA Modification and Hybridization Process Using Custom-made Gold Interdigital Microelectrode Arrays

Abstract body:

Detection of specific DNA sequences in biological samples has been playing a fundamental role in genetic diagnostic for rapid identification of diseases. Considerable effort has been made to miniaturize and integrate the DNA hybridization detection process in a single disposable chip. Here, we propose a non-faradaic, label-free, electrochemical method based on capacitance measurement to sense DNA surface modification and hybridization.

For this, we created custom-made gold interdigital microelectrodes arrays using photolithography technique. Silver electroplating was used to make a stable silver chloride/silver quasi-reference electrode. Self assembled monolayers of single stranded B. Anthracis hairpin were made and exposed to complementary, non-complementary and mismatch strands to study the hybridization and/or non-hybridization processes by means of double layer capacitance (Cdl) measurements at two given applied potentials using Electrochemical Impedance Spectroscopy (EIS) analysis. An increase in Cdl was observed for the non-hybridization interactions when compared to the ssDNA monolayer though not as high as for the hybridization process. This shows that hybridization process is a measurable property to detect specific DNA sequences.

Contact info. Nadja E. Solis Marcano, nadja.enid@gmail.com. University of Puerto Rico, Río Piedras Campus, Graduate Chemistry Department.