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Sensitive silica-alumina modified capacitive non-Faradaic glucose sensor for gestational diabetes

Abstract

A highly sensitive silica-alumina (Si-Al)-modified capacitive non-Faradaic glucose biosensor was introduced to monitor gestational diabetes. Glucose oxidase (GOx) was attached to the Si-Al electrode surface as the probe through amine-modification followed by glutaraldehyde premixed GOx as aldehyde-amine chemistry. This Si-Al (∼50 nm) modified electrode surface has increased the current flow upon binding of GOx with glucose. Capacitance values were increased by increasing the glucose concentrations. A mean capacitance value was plotted and the detection limit was found as 0.03 mg/mL with the regression coefficient value, R^2 = 0.9782 [y = 0.8391x + 1.338] on the linear range between 0.03 and 1 mg/mL. Further, a biofouling experiment with fructose and galactose did not increase the capacitance, indicating the specific glucose detection. This Si-Al–modified capacitance sensor detects a lower level of glucose presence and helps in monitoring gestational diabetes.

Keywords

Biomarker; Capacitive non-Faradaic sensor; Gestational diabetes; Glucose oxidase