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Amperometric Biosensor with Al_2O_3/Al Foil Electrodes Modified by Pt Nanofuzz for Glucose Detection

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Electrodes of Al_2O_3/Al foils modified with Pt nanofuzz, which has a morphology resembling "fuzz," were fabricated by a novel method with a simple replacement reaction. Glucose oxidase was immobilized by cross-linking via glutaraldehyde, so as to form a new type of biosensor. The microstructure and composition of the electrodes were characterized by scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS), and the electrocatalytic ability of the sensor was determined from capacitance-voltage (C-V) curves. The sensors exhibited a high sensitivity of 56.79 $\mu A \cdot mM^{-1}cm^{-2}$ at +0.6 V (vs SCE). A linear range of response was found from 0.25 to 8 mM of glucose, with response time <10 s. The detection limit of the sample was estimated to be 12.5 $\mu M/cm^2$ (S/N = 3), and the Michaelis-Menten constant was calculated to be 7.35 mM. The optimal amount of glucose oxidase on the response current of the sensors was 20 U per electrode, and the optimal pH value was 6.86. The stability and selectivity of the sensors were also evaluated. By using uricase and cholesterol oxidases, this technique may be applied to other biosensors for the detection of uric acid and cholesterol.

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