Cholesterol sensor based on Sn-doped Titanate nanostructures

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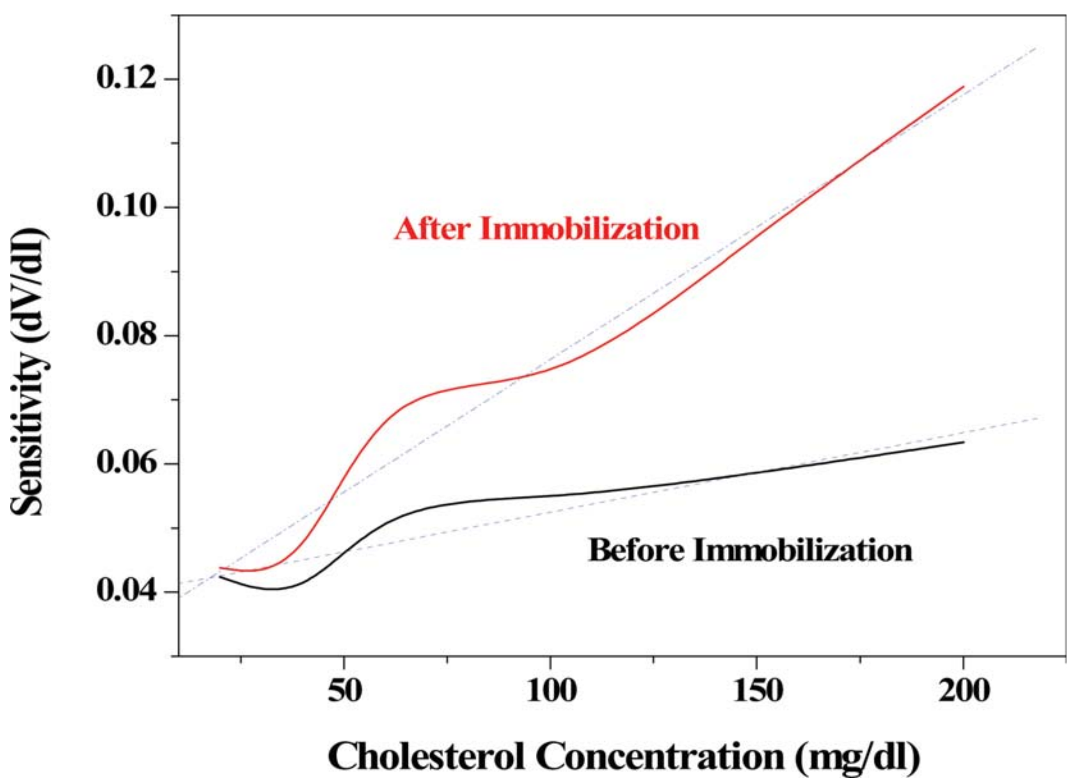
The need for more accurate and stable biosensors has increased and recently made significant advances giving better fabrication and characterization techniques for analyte detection at lower concentration ranges. Although there is optimism for the potential applications of biosensors since the successful development of biosensors has been hampered considerably by crucial requirements, such as immobilization and stability of biological molecules. Biosensors offer great advantages over conventional analytical techniques being extremely



sensitive, selective, rapid and reproducible analytical tools. Basically, enzymes are preferably used as sensing agents over living cells due to the problem of cell's low selectivity. Hence in last few decades, development of enzyme based biosensors has been a topic of considerable interest with intrinsic selectivity to enzymatic reactions, reliability and possibility of commercialization. Cholesterol is a small molecule, one of the steroids; essential to life. The levels range from less than 50mg/dl in infants to an average of 215mg/dl in adults and it can be high up to ~1,200mg/dl or more in individuals suffering from a rare, inherited disorder called familial hypercholesterolemia. For those in the normal range, approximately two-thirds of cholesterol is transported as LDLs and the rest 1/3 is carried by so-called high density lipoproteins (HDLs). Because of their relationship to cardiovascular disease, the analysis of serum lipids has become an important health measure. In this research, we present cholesterol sensing properties of Sn-doped titanate nanostructure. Sn-doped nanomaterial was prepared using hydrothermal method at 150°C for 24–48 hours followed by calcination at 350°C. FESEM observations reveals that individual spherical particles were agglomerated forming the larger size nano particles during hydrothermal process. Thick films of these powders were deposited using screen printing technique on electropolished aluminum substrates. Cholesterol Oxidase (COx) was immobilized on the films by soaking in COx solution for 15 h which is covalently attached on the sample surface. After the COx immobilization, films conductivity is decreased as measured in the buffer solution. Further, the conductivity linearly decreases as a function of cholesterol concentration when tested over the wide range of cholesterol concentration i.e. 1mg/dl to 200 mg/dl, as shown here.