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The Strategy for Detection of Catecholamines in Body Fluids: Optical Sensor

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Abstract : Catecholamines are the principal neurotransmitters that mediate a variety of the central nervous system functions, such as motor control, cognition, emotion, memory processing, and endocrine modulation. Dysfunctions in catecholamine neurotransmission are induced in some neurologic and neuropsychiatric diseases. Changeable neurotransmitters level in biological fluids can be a marker of several neurological disorders. Because of its significance in analytical techniques and diagnostics, sensitive and selective detection of neurotransmitters is increasingly attracting a lot of attention in different areas of bio-analysis or biomedical research. Recently, fluorescent techniques for detection of catecholamines have attracted interests due to their reasonable cost, convenient control, as well as maneuverability in biological environments. Nevertheless, with the observed need for a sensitive and selective catecholamines sensor, the development of a convenient method for this neurotransmitter is still at its basic level. The manipulation of nanostructured materials in conjunction with biological molecules has led to the development of a new class of hybrid modified biosensors in which both enhancement of charge transport and biological activity preservation may be obtained. Immobilization of biomaterials on electrode surfaces is the crucial step in fabricating electrochemical as well as optical biosensors and bioelectronic devices. Continuing systematic investigation in the manufacturing of enzyme–conducting sensitive systems, here is presented a convenient fluorescence sensing strategy for catecholamines detection based on FRET (fluorescence resonance energy transfer) phenomena observed for, i.e., complexes of Fe^{2+} and epinephrine. The biosensor was constructed using low temperature co-fired ceramics technology (LTCC). This sensing system used the catalytical oxidation of catecholamines and quench of the strong luminescence of obtained complexes due to FRET. The detection process was based on the oxidation of substrate in the presence of the enzyme–laccase/tyrosinase.

Keywords : biosensor, conducting polymer, enzyme, FRET, LTCC
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