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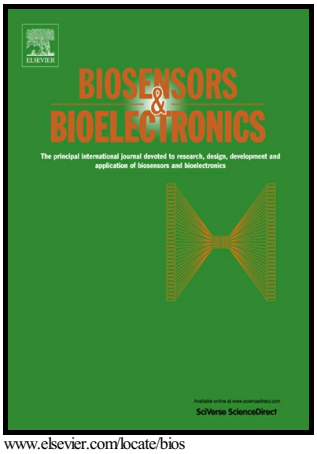

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Multiple functional strategies for amplifying sensitivity of amperometric immunoassay for tumor markers: a review

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Abstract

Multiple functional strategies have shown great potential in ultrasensitive amperometric immunoassays for tumor markers, which promote conductivity and signal multiple amplification. The sensitivity of amperometric immunoassays is significantly affected by the conductivity and specific area of the sensing interface as well as the electrochemical activity of redox species. Thus, these strategies are generally based on integrating various materials together and endowing immunosensing systems with many advantages, such as large specific area, high electrochemical activity, good conductivity, biocompatibility, and catalytic performance. Owing to the rapid development of functional materials (such as conductive hybrids, catalytic hybrids, enzyme-like materials, highly electrochemical active species, redox nanocomposites, porous materials, hydrogels, and metal-organic framework) and new bioactive substances (including new blocking agents and receptors like peptides and oligonucleotide chains), the sensitivity of related biosensors is usually higher than that of traditional ones, indicating that multiple functional strategies are promising in amperometric immunoassays. Herein, we provide an overview of recent advances in multiple functional strategies that have proven to dramatically enhance the sensitivity of amperometric immunoassays, which incorporate the following materials: (1) conductive nanomaterials hybrids; (2)