Nanomaterials enriched biosensors for electrochemical monitoring of nucleic acid interactions

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Abstract
The development of nanomaterials enriched biosensors could impact significantly the areas of genomics, proteomics, biomedical diagnostics and drug discovery since these nanomaterials have some advantages as unique electronic, optical, mechanical, and catalytic properties. Especially they hold a great potential for monitoring of sequence-specific nucleic acid hybridization related to clinical, environmental, or forensic investigations [1,2].
Numerous nanomaterials such as, carbon nanotubes, metallic nanoparticles, graphene and its derivatives, fullerenes, carbon nanofibers etc. have different applications in drug delivery, cancer therapy, tissue engineering and diagnosis including biosensors [3-5].
After the discovery of electroactivity in nucleic acids in 1959 [6], there has been a great interest to develop electrochemical methods for DNA analysis, including electrochemical biosensors. Electrochemical DNA biosensors have an inherent specificity of biorecognition reactions with the high sensitivity of physical transducers in order to analyze sequence-selective nucleic acid hybridization and the interaction of nucleic acids with drugs, proteins, DNA-targetted molecules [1-4,7-11]. Recent developments of electrochemical nucleic acid biosensors based on various nanomaterials have been overviewed herein, and discussed with their further prospects.

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References

[1] E. Palecek & M. Bartosík, Chem. Rev. 112 (2012) 3427-3481.
[2] J. Wang, Electroanalysis. 17 (2005) 7-14.
[3] A. Erdem, Talanta. 74 (2007) 318-325.
[4] F. Arduini, L. Micheli, D. Moscone, G. Palleschi, S. Piermarini, F. Ricci, G. Volpe, TrAC Trends in Analytical Chemistry. 79 (2016) 114-126.
[5] M.J. Mitchell, M.M. Billingsley, R.M. Haley, M.E. Wechsler, N. A. Peppas, R. Langer, Nat Rev Drug Discov. 20 (2021) 101-124.
[6] E. Palecek, Nature. 188 (1960) 656-657.
[7] A. Erdem & G. Congur, Colloids And Surfaces B: Biointerfaces. 117 (2014) 338-345.
[8] A. Erdem & E. Eksin, Analytica Chimica Acta. 1071 (2019) 78-85.
[9] E. Eksin, H. Senturk, E. Zor, H. Bingol, A. Erdem, Journal of Electroanalytical Chemistry. 862 (2020) 114011, 1-8.
[10] M. Findik, H. Bingol, A. Erdem, Talanta. 222 (2021) 121647, 1-9.
[11] D. Isin, E. Eksin, A. Erdem, Biosensors. 12(2) (2022) 95, 1-16.