REFERENCES

1. Bardeen, J., Cooper, L., Schriffer, J.R. (1957). Theory of superconductivity. *Physical Review*. 108:1175-1204.
2. Beaty, H., Fink, D. (1987). *Standard Handbook for Electrical Engineers* 11th Edition, pages 17-19.
3. Antognett, P., Massobrio, G. (1990). *Semiconductor device modeling with spice*. McGraw-Hill, Inc. New York, NY, USA ©1990 ISBN:0070021538.
4. Lux, F. (1993). Models proposed to explain the electrical conductivity of mixtures made of conductive and insulating materials. *Journal of Materials Science*. 28 (2):285–301.
5. Shirakawa, H., Louis, E.J., MacDiarmid, A.G., Chiang, C.K., & Heeger, A.J. (1977). Synthesis of electrically conducting organic polymers: halogen derivatives of polyacetylene, (CH)x. *J. Chem. Soc., Chem. Commun.* 16:578-580.
6. Heeger, A.J. (2001). Nobel lecture: Semiconducting and metallic polymers: The fourth generation of polymeric materials. *Rev. Mod. Phys.* 73:681-700.
7. Chiang, C., Park, Y., Heeger, A., Shirakawa, H., Louis, E., & MacDiarmid, A.G. (1978). Conducting polymers: Halogen doped polyacetylene. *J. Chem. Phys.* 69:5098-5104.
8. Guimard, N.K., Gomez, N., & Schmidt, C.E. (2007). Conducting polymers in biomedical engineering. *Prog. Polym. Sci.* 32:876-921.
9. Jenkins, A.D., Kratochvil, P., Stepto, R.F.T., & Suter, U.W. (1996). Glossary of basic terms in polymer science. *Pure & Appl. Chem.* 68:2287-2311.
10. Jensen, W.B. (2008). The origin of the polymer concept. *J. Chem. Educ.* 85:624.
11. Namazi H. (2017). Polymers in our daily life. *BioImpacts*. 7:73-74.
12. Kumar, V. (2012). Characterization of Conducting polymer composites and non-conducting polymers with exposure of neutrons, Gamma rays and charged particles, P.h.D. thesis, Sant Longowal Institute of Engineering and technology, Punjab, India.
13. Muelhaupt, R. (2004). Hermann Staudinger and the origin of macromolecular chemistry. *Angew. Chem. Int. Ed.* 43:1054-1063.

14. Delaware, W. (2000). The Establishment of Modern Polymer Science by Wallace H. Carothers. *American chemical society*.
15. James, L.K. (1995). *Nobel laureates in chemistry 1901-1992*, The American chemical society and the chemical heritage foundation, United States of America.
16. Ekspong, G. *Nobel lectures in physics 1991-1995*, world scientific publishing company, Singapore.
17. Bredas, J. L., Marder S. R. and Salaneck, W. R. (2002). Tribute to Alan J. Heeger, Alan G. MacDiarmid, and Hideki Shirakawa. *Macromolecules*., 35(4):1.
18. Pohl, H.A., Bornmann, J. A., and Itoh, W. (1961). *Am. Chem. Soc. Poly. Chem. Preprints*, 2(1):211.
19. Katon, J. E., Wildi, B. S. (1964). Semiconducting Organic Polymers Derived from Nitriles. Thermoelectric Power and Thermal Conductivity Measurements. *J. Chem. Phys.*, 40(10):2977.
20. Pohl, H. A., and Engelhardt, E. H. (1962). Synthesis and characterization of some highly conjugated semiconducting polymers. *J. Phys. Chem*., 66:2085.
21. Shirakawa, H. (2001). Nobel Lecture: The discovery of polyacetylene film-the dawning of an era of conducting polymers, *Rev. Mod. Phys.* 73:713-718.
22. Wernet. W., Monkenbusch. M.,Wegner. G. (1984). A new series of conducting polymers with layered structure: Polypyrrole alkylsulfates and alkylsulfonates. *Makromol.chem.Rapid Commun*. 5(3):157-164.
23. Cui, C. X., and Kertesz, M. (1989). Two helical conformations of Polythiophene, polypyrrole, and their derivatives, *Phys. Rev. B.,* 40 (14):9661-9670.
24. Groenendaal, L., Jonas, F., Freitag, D., Pielartzik, H and Reynolds, J.R. (2000). Poly(3,4-ethylenedioxythiophene) and Its Derivatives: Past, Present, and Future. *Adv. Mater,* 12(7):481-494.
25. Daoust, G., and Leclerc, M. (1991). Structure-property relationships in alkoxy-substituted polythiophenes. *Macromolecules*, 24 (2):455–459.
26. McCullough, R.D., Tristram-Nagle, S., Williams, S.P., Lowe, R.D and Jayaraman, M. (1993). Self-orienting head-to-tail Poly (3-alkylthiophenes): new insights on structure-property relationships in conducting polymers. *J. Am. Chem. Soc*., 115 (11): 4910–4911.

27. Paloheimo, J., Kuivalainen, P., Stubb, H., Vuorimaa, E., and Yli-Lahti., P. (1990). Molecular field-effect transistors using conducting polymer Langmuir–Blodgett films. *Appl. Phys. Lett.* 56 (12):1157-1159.
28. Adam, K., Wanekaya, A. K., Bangar, M.A., Yun, M., Chen, W., Myung, N.V., Mulchandani, A. (2007). *J. Phys. Chem. C*, 111 (13):5218-5221.
29. Kymakis, E., and Amaratunga, G. A. J. (2002). Single-wall carbon nanotube/conjugated polymer photovoltaic devices. *Appl. Phys. Lett.* 80:112.
30. Ago, H., Petritsch, K., Shaffer, M.S.P., Windle, A.H., Friend, R.H. (1999). Composites of Carbon Nanotubes and Conjugated Polymers for Photovoltaic Devices. *Adv. Mater.* 11:1281-1285.
31. Snook, G.A., Kao, P., Best, A. (2011). Conducting-polymer-based Supercapacitor devices and electrodes. *Journal of Power Sources* 196:1-12.
32. Eftekhari, A., Lei, L., Yang, Y. (2017). Polyaniline supercapacitors. *Journal of Power Sources,* 347:86-107.
33. Yildiz, U.H., Sahin, E., Akhmedov, I., Tanyeli, C., Toppare, L. (2006). A new soluble conducting polymer and its electrochromic devices. *Polym Chem,* 44:2215-2225.
34. Schwendeman, I., Hickman, R., Sonmez, G., Schottland, P., Zong, K., Welsh, D.M., Reynolds, J.R. (2002). Enhanced Contrast Dual Polymer Electrochromic Devices. *Chem. Mater*., 14 (7):3118-3122.
35. Madden, J.D., Cush, R.A., Kanigan, T.S., Hunter,I.W. (2000). Fast contracting polypyrrole actuators. *Synth. Met.,* 113:185- 192.
36. Alici, G., Devaud, V., Renaud, P., Spinks, G. (2009). Conducting polymer microactuators operating in air. *J. Micromech. Microeng*., 19:025017.
37. Kwon, O.S., Park, S.J., Yoon, H., Jang, J. (2012). Highly sensitive and selective chemiresistive sensors based on multidimensional polypyrrole nanotubes. *Chem. Commun*. 48:10526-10528.
38. Yoon, H., Chang, M., Jang, J. (2007). Formation of 1D poly(3,4-ethylenedioxythiophene) nanomaterials in reverse microemulsions and their application to chemical sensors. *Adv. Funct. Mater.* 17:431-436.
39. Wallace, G.G., Smyth, G.G., Zhao, M. H. (1999). Conducting electroactive polymer-based biosensors. *TrAC Trends in Analytical Chemistry*, 18:245-251.

40. Contractor, A.Q., Sureshkumar, T.N., Narayanan, R., Sukeertha, S., Lal, R., Srinivasa, R.S. (1994). Conducting polymer-based biosensors. *Electrochimica Acta*, 39: 1321-1324.
41. Schuhmann, W., Johanna, C.K., Wohlschläge, H.H. (1993). Conducting polymer-based amperometric enzyme electrodes. Towards the development of miniaturized reagentless biosensors. *Synthetic Metals*, 61: 31-35.
42. Orton, J.W. (2004). *The story of the semiconductor,* Oxford University Press Inc, New York.
43. Atkins, P.W., Paula, J.D. (2002). *Physical Chemistry,* Oxford University Press, Canada.
44. Stafstrom, S., Chao, K.A. (1984). Polaron-bipolaron–soliton doping in polyacetylene. *Phys. Rev. B* 30:2098-2103.
45. Bredas, J.L., Street, G.B. (1985). Polarons, bipolarons, and solitons in conducting polymers. *Acc. Chem. Res.,*18:309-315.
46. Bakhshi, A., Kaur, A., Arora, V. (2012). Molecular engineering of novel low band gap conducting polymers. *Indian J. Chem., Sect A*, 51(1):57.
47. Ravichandran, R., Sundarrajan, S., Venugopal, J.R., Mukherjee, S., Ramakrishna, S. (2010). Applications of conducting polymers and their issues in biomedical engineering. *J. R. Soc. Interface.*,7:S559-S579.
48. Wise, D.L., Wnek, G.E., Trantolo, D.J., Cooper, T.M., Gresser, J.D., Marcel, D. (1998). *Electrical and Optical Polymer Systems: Fundamentals, Methods and Application*; CRC Press: Boca Raton, FL, USA, 1031-1040.
49. Salaneck, W.R., Friend, R.H., Bredas, J.L. (1999). Electronic structure of conjugated polymers: Consequences of electron-lattice coupling. *Phys. R.* 319(6): 231-251.
50. Stafstrom, S., Chao, K. (1984). Polaron-bipolaron-soliton doping in polyacetylene. *Phys. Rev. B*. 30(4):2098.
51. Lyons, M. E. G. (1994). Charge Percolation in Electroactive Polymers. In *Electroactive Polymer Electrochemistry Part 1: Fundamentals*, New York: Plenum Press, 1-226.
52. Heeger, A.J., Kivelson, S., Schrieffer, J., & Su. (1988). W.-P. Solitons in conducting polymers, *Rev. Mod. Phys.* 60(3): 781.

53. Cuuran, S., Hauser, A.S., Roth, S. (1997). Conductive polymers: *Synthesis and electrical properties*. In Handbook of Organic Conductive Molecules and Polymers; John Wiley & Sons: New York, NY, USA, 2:1-60.

54. MacDiarmid, A.G., Mammone, R.J., Kaner, R.B., Porter, S.J., Pethig, R., Heeger, A.J., Rosseinsky, D.R. (1985). The concept of doping of conducting polymers: The role of reduction potentials. *Phil. Trans. R. Soc. A*, 314:3-15.

55. Balint, R., Cassidy, N.J., Cartmell, S.H. (2014). Conductive polymers: Towards a smart biomaterial for tissue engineering. *Acta biomaterialia* 10(6): 2341-2353.

56. Ranella, A., Barberoglou, M., Bakogianni, S., Fotakis, C., Stratakis, E. (2010). Tuning cell adhesion by controlling the roughness and wettability of 3D micro/nano silicon structures. *Acta Biomater.*, 6:2711-2720.

57. Huang, H.H., Ho, C.T., Lee, T.H., Lee, T.L., Liao, K.K., Chen FL. (2004). Effect of surface roughness of ground titanium on initial cell adhesion. *Biomol Eng*, 21:93-7.

58. Deligianni, D.D., Katsala, N.D., Koutsoukos, P.G., Missirlis, Y.F. (2001). Effect of surface roughness of hydroxyapatite on human bone marrow cell adhesion, proliferation, differentiation and detachment strength. *Biomaterials.*, 22:87-96.

59. MacDiarmid, A.G. (2001). "Synthetic metals": A novel role for organic polymers. *Angew. Chem. Int. Ed.* 40(14):2581-2590.

60. Hodgson, A.J., Gilmore, K, Small, C., Wallace, G.G., Mackenzie, I.L., Aoki, T. (1994). Reactive supramolecular assemblies of mucopolysaccharide, polypyrrole and protein as controllable biocomposites for a new generation of ''intelligent biomaterials''. *Supramol Sci.*,1:77-83.

61. Macdiarmid, A.G., Epstein, A.J. (1995). Secondary doping: A new concept in conducting polymers., *Macromolecular Symposia*, 98:835-842.

62. Dai, L., He, Q., & Bai, F. (2002). Photogeneration of conducting polymer patterns in iodinated cis-1, 4-polybutadiene films. *Thin solid films*, 417(1):188-193.

63. MacDiarmid, A. G., Mammone, R. J., Kaner, R. B., Porter, S. J. (1985). The concept of 'doping' of conducting polymers: the role of reduction potentials. *phil. Trans. R. Soc. Lond. A,* 314(1528):3-15.

64. Genoud, F., Guglielmi, M., Nechtschein, M., Genies, E., Salmon, M. (1985). ESR study of electrochemical doping in the conducting polymer polypyrrole, *Phys Rev Lett.* 55(1):118-121.

65. Heeger, A.J., Kivelson, S., Schrieffer, J.R., Su, W.P. (1988). Solitons in conducting polymers., *Rev. Mod. Phys.* 60:781

66. Garnier, F., Hajlaoui, R., Yassar, A., Srivastava, P. (1994). All-polymer field-effect transistor realized by printing techniques. *Science,* 265:1684.

67. Bredas, J.L., Street, G.B. (1985). Polarons, bipolarons, and solitons in conducting polymers. *Acc. Chem. Res.* 18(10):309-315.

68. Heeger, A.J. (1985). Charge Storage in Conducting Polymers: Solitons, Polarons, and Bipolarons. *Polymer Journal*,17: 201–208.

69. Brazovskii, S. A., Kirova, N. N. (1981). Excitons, polarons, and bipolarons in conducting polymers. *JETP Lett.,* 33:4.

70. Bardeen, J., Cooper, L.N., Schrieffer, J.R. (1957). Theory of Superconductivity. *Phys. Rev.,* 108:1175.

71. Su, W.P., Schrieffer, J.R., Heeger. A.J. (1983). Soliton excitations in polyacetylene. *Phys. Rev. B* 28:1138.

72. Su, W.P., Schrieffer, J.R., Heeger. A.J. (1979). Solitons in Polyacetylene. *Phys. Rev. Lett.* 42:1698-1701.

73. Myers, R.E. (1986). Chemical oxidative polymerization as a synthetic route to electrically conducting polypyrroles. *Journal of Electronic Materials*.,15:61–69.

74. Toshima, N., Hara, S. (1995). Direct synthesis of conducting polymers from simple monomers. *Prog. Polym. Sci*., 20:155- 183.

75. Niemi, V. M., Knuuttila, P., Osterholm, J.E. (1992). Polymerization of 3-alkylthiophenes with $FeCl_3$. *Polymer 33*:1559-1562.

76. Heyrovsky, J. (1918). *Introduction, review on cyclic voltammetry and theoretical considerations*. PhD thesis., Czech University., Prague.

77. Martins, N.C.T., Moura Silva, M., Montemora, M.F., Fernandes, J.C.S., Ferreira, M.G.S. (2008). Electrodeposition and characterization of polypyrrole films on aluminium alloy 6061-T6. *Electrochim Acta*, 53:4754-63.

78. Herrasti, P., Diaz, L., Ocon, P., Ibanez, A., Fatas, E. (2004). Electrochemical and mechanical properties of polypyrrole coatings on steel. *Electrochim Acta*, 49:3693–3699.

79. Li, C.M., Sun, C.Q., Chen, W., Pan, L. (2005). Electrochemical thin film deposition of polypyrrole on different substrates. *Surf Coat Technol.*,198:474–477.
80. Kaplin, D.A., Qutubuddin, S. (1995). Electrochemically synthesized polypyrrole films:effects of polymerization potential and electrolyte type. *Polymer*., 36:1275–1286.
81. Sutton, S.J., Vaughan, A.S. (1995). On the morphology and growth of electrochemically polymerized polypyrrole. *Polymer*, 36:1849–57.
82. Kaynak, A. (1997). Effect of synthesis parameters on the surface morphology of conducting polypyrrole films. *Mater Res Bull*., 32:271–85.
83. Miguel G.X., Everaldo C.V., Ernesto C.P., Fabio L.L., Edson R. L., Alan G.M., Mattoso, L. H. C. (2009). Synthesis of Nanoparticles and Nanofibers of Polyaniline by Potentiodynamic Electrochemical Polymerization. *Journal of Nanoscience and Nanotechnology,*9: 2169-2172.
84. Roncali, J. (1992). Conjugated poly(thiophenes): synthesis, functionalization, and applications. *Chem. Rev*., 92 (4):711–738.
85. Tsai, T.H., Lin, K.C., Chen, S.M. (2011). Electrochemical Synthesis of Poly(3,4-ethylenedioxythiophene) and Gold Nanocomposite and Its Application for Hypochlorite Sensor. *Int. J. Electrochem. Sci.,* 6:2672 -2687.
86. Hou, Y., Wang, D., Yang, X.H., Fang, W.Q., Zhang, B., H.F. Wang, H.F., G.Z. Lu, G.Z., Hu,P., Zhao, H.J., Yang, H.G. (2013). Rational screening low-cost counter electrodes for dye sensitized solar cells. *Nat. Commun*., 4:1583.
87. Wenjing, H., Yaoming, X., Gaoyi, H., Haihan, Z. (2016). Electro-polymerization of polypyrrole/multi-wall carbon nanotube counter electrodes for use in platinum-free dye-sensitized solar cells, *Electrochimica Acta*.,190:720-728.
88. Wu, J., Li, Q., Fan, L., Lan, Z., Li, P., J. Lin, J., Hao, S. (2008). High-performance polypyrrole nanoparticles counter electrode for dye-sensitized solar cells. *J. Power Sources*, 181:172.
89. Jeon, S., Kim, C., Ko, J., Im, S. (2011). Spherical polypyrrole nanoparticles as a highly efficient counter electrode for dye-sensitized solar cells, *J. Mater. Chem.* 21:8146.

90. Xiao, Y., Han, G., Li, Y., Li, M., Chang, Y. (2014). High performance of Pt-free dye-sensitized solar cells based on two-step electropolymerized polyaniline counter electrodes, *J. Mater. Chem. A* 2:3452.

91. Xiao, Y., Lin, J., Wu, J., Tai, S., Yue, G. (2013). Dye-sensitized solar cells with highperformance PANI/MWCNT counter electrodes electropolymerized by a pulse potentiostatic technique. *J. Power Sources*, 233:320.

92. Chen, J., Li, B., Zheng, J., Zhao, J., Jing, H., Zhu, Z. (2011). Polyaniline nanofiber/carbon film as flexible counter electrodes in platinum-free dye-sensitized solar cells, *Electrochim. Acta,56*:4624.

93. Xiao,Y., Lin, J., Wu, J., Tai, S., Yue, G. (2012). Pulse potentiostatic electropolymerization of high performance PEDOT counter electrodes for Pt-free dye-sensitized solar cells, *Electrochim. Acta* 83:221.

94. Hong, W., Xu, Y., Lu, G., Li, C., Shi, G. (2008). Transparent graphene/PEDOT–PSS composite films as counter electrodes of dye-sensitized solar cells. Electrochemistry Communications 10 (2008) 1555–1558.

95. Kirchmeyer, S., Reuter, K. (2005). Scientific importance, properties and growing applications of poly(3,4-ethylenedioxythiophene)., Journal of Materials Chemistry,15 (21): 2077-2088.

96. Zhou, H., Zhai, H.J., Han, G. (2016). Superior performance of highly flexible solid-state supercapacitor based on the ternary composites of graphene oxide supported poly(3,4-ethylenedioxythiophene)-carbon nanotubes. *Journal of Power Sources*, 323:125-133.

97. Lee, S.Y., Kim, J., Park, S.J. (2014). Activated carbon nanotubes/polyaniline composites as supercapacitor electrodes. *Energy*, 78:298-303.

98. Zhang, J., Kong, L.B., Wang, B., Luo, Y.C., Kang, L. (2009). In-situ electrochemical polymerization of multi-walled carbon nanotube/polyaniline composite films for electrochemical supercapacitors. *Synth Met*, 159:260-266.

99. Gui, D., Liu, C., Chen, F., Liu, J. (2014). Preparation of polyaniline/graphene oxide nanocomposite for the application of supercapacitor. *Appl Surf Sci*, 307:172-177.

100. He, X., Liu, G., Yan, B., Suo, H., Zhao, C. (2016). Significant enhancement of electrochemical behaviour by incorporation of carboxyl group functionalized carbon nanotubes into polyaniline based supercapacitor. *European Polymer Journal*, 83:53–59.

101. Oueiny, C., Berlioz, S., Perrin, F.X. (2014). Carbon nanotube-polyaniline composites, *Prog. Polym. Sci*., 39: 707–748.

102. Lange, U., Roznyatovskaya, N.V., Mirsky, V.M. (2008). Conducting polymers in chemical sensors and arrays., *Analytica chimica Acta* 614:1–26.

103. Brooke, R., Mitraka, E., Sardar, S., Sandberg, M., Sawatdee, A., Berggren, M., Crispin, X., and Jonsson, M.P. (2017). Infrared electrochromic conducting polymer devices. *J. Mater. Chem. C,*5:5824-5830.

104. Checkol, F., Elfwing, A., Greczynski, G., Mehretie, S., Inganas, O., Admassie, S. (2018). Highly stable and efficient lignin-PEDOT/PSS composites for removal of toxic metals. *Adv. Sustain. Systems*, 2:1700114.

105. Ravichandran, R., Sundarrajan, S., Venugopal, J. R., Mukherjee, S., Ramakrishna, S. (2010). Applications of conducting polymers and their issues in biomedical engineering. *J. R. Soc., Interface*, 7:S559− S579.

106. Xia, L., Wei, Z., Wan, M. (2010). Conducting Polymer Nanostructures and their Application in Biosensors. *J. Colloid. Interf. Sci*., 341:1-11.

107. Wang, C.H., Dong, Y.Q., Sengothi, K., Tan, K.L., Kang, E.T. (1999). In Vivo Tissue Response to Polyaniline. *Synth. Met*., 102: 1313-1314.

108. Malhotra, B.D., Chaubey, A., Singh, S.P. (2006). Prospects of conducting polymers in biosensors, *Anal. Chim. Acta.*, 578 (1): 59-74.

109. Schuhmann, W., Lammert, R., Hammerle, M., Schmidt, H.L., Electrocatalytic properties of polypyrrole in amperometric electrodes. (1991). *Biosens. Bioelectron.* 6:689-697.

110. Strike, D.J., Rooij, N.F., Hep, M.K., Electrodeposition of glucose oxidase for the fabrication of miniature sensors, *Sens. Actuators B.*, 13(3):61-64.

111. Bartlett, P.N., Birkin, P.R. (1993). The application of conducting polymers in biosensors. *Syn. Met.* 61:15-21.

112. Guerente, L.C., Cosnier, S., Innocent, C., Mailley, P., Moutet, J.C., R.M. Morelis, R.M., Leca, B., Coulet, P.R. (1993). Controlled electrochemical preparation of enzymatic layers for the design of amperometric biosensors, *Electroanalysis* 5:647-652.

113. Ahuja., T.R., Kumar, D. (2009). Recent progress in the development of nano-structured conducting polymers/nanocomposites for sensor applications. *Sens. Actuator B Chem.*,136(1):275–286.

114. Higgins, I.J., Hill, H.A., Plotkin, E. V. (1983). *Measurement of enzyme catalysed reactions.* European Patent 125137. 14th Nov.

115. Tully, E., Higson, S.P., Kennedy, R.O. (2008). The development of a 'labeless' immunosensor for the detection of Listeria monocytogenes cell surface protein, internalin B. *Biosens. Bioelectronics.*, 23(6):906–912.

116. Bartlett, P.N. (1993). A review of the immobilization of enzymes in electropolymerized films. *Journal of Electroanalytical Chemistry*, 362:1-12.

117. Manohar, B., Divakar, S. (2005). An artificial neural network analysis of porcine pancreas lipase catalysed esterification of anthranilic acid with methanol. *Process Biochem*, 40: 3372-3376.

118. Mathewson, P. R. (1998). *Enzymes handbook.* St Paul: Eagan Press.

119. Longo, M. A., Combes, D. (1997). Influence of surface hydrophilic/hydrophobic balance on enzyme properties. *Journal of Biotechnology* 58:21–32.

120. Cen, L., Neoh, K.G., Li, Y.L., Kang, E.T. (2004). Assessment of in vitro bioactivity of hyaluronic acid and sulfated hyaluronic acid functionalized electroactive polymer. *Biomacromolecules*, 5:2238–2246.

121. Nanduri, V., Sorokulova, I.B., Samoylov, A.M., Simonian, A.L., Petrenko, V.A., Vodyanoy, V. (2007). Phage as a molecular recognition element in biosensors immobilized by physical adsorption. *Biosens. Bioelectron.*, 22: 986-992.

122. Gupta, R., Chaudhury, N.K. (2007). Entrapment of biomolecules in sol-gel matrix for applications in biosensors: problems and future prospects. Biosens. Bioelectron. 22: 2387-2399.

123. Schuhmann, W., Lammert, R., Uhe, B., Schmidt, H.L. (1990). Polypyrrole, a new possibility for covalent binding of oxidoreductases to electrode surfaces as a base for stable biosensors. *Sensor Actuat. B-Chem.*, 1: 537-541.

124. Nenkova, R., Ivanova, D., Vladimirova, J., Godjevargova, T. (2010). New amperometric glucose biosensor based on cross-linking of glucose oxidase on silica gel/multiwalled carbon nanotubes/polyacrylonitrile nanocomposite film. *Sensor Actuat. B-Chem.* 148: 59-65.

125. Manz, A., Pamme, N., Iossifidis, D. (2004). *Bioanalytical Chemistry.* London: Imperial College Press.

126. Foulds, N.C., Lowe, C.R. (1988). Immobilization of glucose oxidase in ferrocene modified pyrrole polymers, *Anal. Chem.* 60:2473–2478.
127. Situmorang, M., Gooding, J.J., Hibbert, D.B., Barnett, D. (1998) Electrodeposited polytyramine as an immobilization matrix for enzyme biosensors. *Biosensors & Bioelectronics*, 13:953-962.
128. Cheung, D.T, Nimni, M.E. (1982). Mechanism of crosslinking of proteins by glutaraldehyde I: reaction with model compounds. *Connect Tissue Res*., 10(2):187-99.
129. McNaught, A.D., Wilkinson, A. (1997). IUPAC. *Compendium of Chemical Terminology, The Gold Book*. Second Edition, Blackwell Scientific Publications, Oxford.
130. Gerard, M., Chaubey, A., Malhotra, B.D. (2002). Application of conducting polymers to biosensors. *Biosenors Bioelectron,* 17:345–59.
131. Vo-Dinh, T., Cullum, B. (2000). Biosensors and biochips: advances in biological and medical diagnostics. *Fresenius Journal of Analytical Chemistry*, 366(6-7):540-51.
132. Thevenot, D.R., Toth, K., Durst, R.A., Wilson, G.S. (1999). Electrochemical biosensors recommended definitions and classification. *Pure. Appl. Chem.* 71: 2333-2348.
133. Velasco-Garcia, M.N. (2009). Optical biosensors for probing at the cellular level: a review of recent progress and future prospects. *Semin. Cell. Dev. Biol.*, 20:27-33.
134. Janshoff, A., Galla, H.J., Steinem, C. (2000). Piezoelectric Mass-Sensing Devices as Biosensors-An Alternative to Optical Biosensors. *Angew. Chem.Int. Ed.* 39: 4004-4032.
135. Mohanty, S.P., Kougianos, E. (2006). Biosensors: a tutorial review, *Ieee Potentials*, 25(2): 35-40.
136. Singh, M., Kathuroju, P.K., Jampana, N. (2009). Polypyrrole based amperometric glucose biosensors. *Sensors and Actuators B*, 143:430-443.
137. Karyakin, A.A., Vuki, M., Lukachova, L.V., Karyakina, E.E., Orlov, A.V., Karpachova, G.P., Wang, J. (1999). Processable polyaniline as an advanced potentiometric pH transducers. *Anal. Chem.* 71:2534-2540.

138. Sadik, O., Wallace, G.G. (1993). Pulsed amperometric detection of proteins using antibody containing conducting polymers. *Anal. Chim. Acta*, 279:209-212

139. Evtugyn, G.A., Budnikov, H.C., Nikolskaya, E.B. (1998). Sensitivity and selectivity of electrochemical enzyme sensors for inhibitor determination. *Talanta* 46:465-484.

140. Malhotra, S., Verma, A., Tyagi, N., Kumar, V. (2017). Biosensors: principle, types and Applications., *IJARIIE-ISSN(O),* 3 (2):3639-3644.

141. Lazcka, O., Del Campo, F.J., and Munoz, F.X. (2007). Pathogen detection: A perspective of traditional methods and biosensors. *Biosensors and Bioelectronics*., 22:1205-1217.

142. Wang, J., Rivas, G., Cai, X., Palecek, E., Nielsen, P., Shiraishi, H., Dontha, N., Luo, D., Parrado, C., Chicharro, M., Farias, P., Valera, F.S. (1997). DNA electrochemical biosensors for environmental monitoring: a review. *Anal Chim Acta*., 347:1-8.

143. Bhalla, N., Jolly, P., Formisano, N., and Estrela, P. (2016). Introduction to biosensors. *Essays Biochem.* 60(1):1-8.

144. D'Souza, S.F. (2001). Microbial biosensors. *Biosensors & Bioelectronics*., 16: 337–353.

145. Yang, L., and Bashir,R. (2008). Electrical/electrochemical impedance for rapid detection of foodborne pathogenic bacteria. *Biotechnol. Adv.*, 26(2):135-150.

146. Carpick, R.W., Sasaki, D.Y., Marcus, M.S., Eriksson, M.A., and Burns, A.R. (2004). Polydiacetylene films: A review of recent investigations into chromogenic transitions and nanomechanical properties. *J. Phys.Condes. Matter.*, 16 (23):R679-R697.

147. Watts, H.J., Lowe, C.R., and Pollard-Knight, D.V. (1994). Optical biosensor for monitoring microbial cells. Anal Chem., 66: 2465-2470.

148. Damborsky, P., Svitel, J., and Katrlik, J. (2016). Optical biosensors. *Essays Biochem.*, 60(1): 91-100.

149. Strianese, M., Staiano, M., Ruggiero, G., Labella, T., Pellecchia, C., D'Auria, S.(2012). Fluorescence-based biosensors. *Methods Mol Biol.* 875:193-216.

150. Pohanka, M. (2017). The Piezoelectric Biosensors: Principles and Applications, a Review. *Int. J. Electrochem. Sci*,12:496 -506.

151. Su, Y.L., Li, J.R., Jiang, L., and Cao, J. (2005). Biosensor signal amplification of vesicles functionalized with glycolipid for colorimetric detection of Escherichia coli. *J. Colloid Interface Sci.*, 284(1):114–119.

152. Wang, J., Electroanalysis .(2001). Glucose biosensors: 40 years of advances and challenges. 13:983-988.

153. Tang, L.X., and Vadgama, P., *Med. Biol. Eng. Comput*. 1990, 28 (3):B18.

154. Clark, L.C., and Lyons, C. (1962). Electrode systems for continuous monitoring in cardiovascular surgery. *Ann. N. Y. Acad. Sci.,*102:29-45.

155. A. L. Smith. (1997). *Oxford dictionary of biochemistry and molecular biology,* Oxford University Press.

156. Schnell, S., Chappell, M.J., Evans, N.D., and Roussel, M.R. (2006). The mechanism distinguishability problem in biochemical kinetics: The single-enzyme, singlesubstrate reaction as a case study. *Comptes Rendus Biologies*, 329:51- 61.

157. Sharma, A., Kumar, A. (2016). Study of structural and electro-catalytic behaviour of amperometric biosensor based on chitosan/polypyrrole nanotubes-gold nanoparticles nanocomposites. *Synthetic Metals*, 220:551-559

158. Stryer, L., Berg, J.M., Tymoczko, J.L.(2002). Biochemistry, fifth edition, San Francisco: W.H. Freeman. ISBN 0-7167-4955-6.

159. Koshland, D.E. (1958). Application of a Theory of Enzyme Specificity to Protein Synthesis. *Proc Natl Acad Sci U S A*, 44(2): 98–104.

160. Carr, P. W., and L. D. Bowers. (1980). *Immobilized Enzymes in Analytical and Clinical Chemistry.* New York: John Wiley and Sons.

161. Ahuja, T., Mir, I.A., Kumar, D. R. (2007). Biomolecular immobilization on conducting polymers for biosensing applications. *Biomaterials*, 28:791-805.

162. Jesionowski, T., Zdarta, J., Krajewska, B. (2014). Enzyme immobilization by adsorption: a review., *Adsorption*, 20:801-821.

163. De Giglio, E., Sabbatini, L., Zambonin, P. G. (1999). Development and analytical characterization of cysteine-grafted polypyrrole films electrosynthesized on Pt and Ti-substrates as precursors of bioactive interfaces. *Biomater Sci Polym Ed*,10:845-58.

164. Collings AF, Caruso F (1997). Biosensors: recent advances, *Rep. Prog. Phys.* 60: 1397-1445.

165. Cosnier S. (1999). Biomolecule immobilization on electrode surfaces by entrapment or attachment to electrochemically polymerized films. A review. *Biosens Bioelectron*, 14:443–56.
166. Monosik, R., Stredansky, M., Sturdik, E. (2012). Biosensors classification, characterization and new trends., *Acta Chimica Slovaca*, 5(1):109-120,
167. Alzari, P. M., Lascombe, M.B., and R. J. Poljak, R.J. (1988). Three-dimensional structure of antibodies. *Annu. Rev. Immunol.* 6:555–580.
168. Kokkinos, P. C., Economou, A., Prodromidis, M.I. (2016). Electrochemical immunosensors: Critical survey of different architectures and transduction strategies. *TrAC Trends in Analytical Chemistry*, 79: 88-105.
169. Mistry, K.K., Layek, K., Mahapatra, A., Roy Chaudhuri, Saha, C.H. (2014). A review on amperometric-type immunosensors based on screen-printed electrodes. *Analyst*, 139: 2289-2311.
170. Burton, D.R. (1993). The structure of immunoglobulins and their interaction with complement. *Activators and Inhibitors of Complement*,7:17-36.
171. Campbell, A.M. (1991). *Monoclonal Antibody and Immunosensor Technology*, 1st edition, 23.
172. Smith B.T. (2012). Introduction to Diagnostic and Therapeutic. *Univ New Mex Heal Sci Cent*, 17(0039): 1–34.
173. Watson J.D., Baker T.A., Bell S.P. (2004). *Molecular Biology of the Gene*. San Francisco, CA, Benjamin Cummings.
174. Van Oss, C. J. (1995). Hydrophobic, hydrophilic and other interactions in epitope-paratope binding. *Mol Immunol*, 32: 199-211.
175. Moore B. P. L. (1982). *Antibody uptake: the first stage of the haemagglutination reaction. In: Bell CA,* editor. A Seminar on Antigen-antibody Reactions Revisited. Arlington VA: AABB; 47-66.
176. Friguet, B, Chaffotte, A.F, Djavadi-Ohaniance, L., Goldberg M.E. (1985). Measurements of the true affinity constant in solution of antigen – antibody complexes by enzyme-linked immunosorbent assay. *J Immunol Methods*,77:305-19.
177. Mayer, G. (2017). *Immunoglobulins-antigen-antibody reactions and selected tests*., Ph.D thesis, Emertius Professor of Pathology, Microbiology and Immunology, University of South Carolina.

178. Zhou ,Y., Goenaga, A.L., Harms, B.D., Zou, H., Lou, J., Conrad, F., Adams, G.P., Schoeberl, B. Nielsen, U.B., Marks, J.D. (2012). Impact of intrinsic affinity on functional binding and biological activity of EGFR antibodies. *Mol Cancer Ther.*,11(7):1467-1476.

179. Hughes-Jones , N.C., Gardner, B., Telford, R.(1964) The effect of pH and ionic strength on the reaction between anti-D and erythrocytes. *Immunol* , **7**: 72-81.

180. Hughes-Jones, N.C. (1975). Red cell antigens, antibodies and their interaction. *Clin Haematol*; 4: 29-43.

181. Atchley, W.A., Bhagavan, N.V., Masouredis, S.P. (1964). Influence of ionic strength on the reaction between anti-D and D-positive red cells. *J Immunol*, 93: 701-12.

182. Jung, Y., J. Y. Jeong, J.Y., and Chung, B.H. (2008). Recent advances in immobilization methods of antibodies on solid supports. *Analyst*, 133:697-701.

183. Wang, C., and Feng, B. (2015) Research progress on site-oriented and three-dimensional immobilization of protein. *Mol. Biol,* 49:1-20.

184. Bilek, M. M., and McKenzie, D.R. (2010). Plasma modified surfaces for covalent immobilization of functional biomolecules in the absence of chemical linkers: towards better biosensors and a new generation of medical implants. *Biophys. Rev.* 2:55.

185. Liu, Y.S., and Yu, J. (2016). Oriented immobilization of proteins on solid supports for use in biosensors and biochips: a review. *Microchim. Acta* 183 (1): 1-19.

186. Bereli, N., Erturk, G., Tumer, M.A., Say, R., and Denizli, A. (2013). Oriented immobilized anti-hIgG via Fc fragment-imprinted PHEMA cryogel for IgG purification. *Biomed. Chromatogr*, 27:599.

187. Welch, N.G., Scoble, J.A., Benjamin W. Muir, and Paul J. Pigram. (2017). Orientation and characterization of immobilized antibodies for improved immunoassays (Review). *Biointerphases,* 12(2):301-312.

188. Bossi, A., Piletsky, S.A., Piletska, E.V., Righetti, P.G., and Turner, A.P.(2001). Surface-Grafted Molecularly Imprinted Polymers for Protein Recognition. *Anal. Chem.* 73:5281.

189. Zhou, D.D., Cui, X.T., Hines, A., Greenberg, R.J. (2010) Conducting polymers in neural stimulation applications. Implantable neural prostheses. *Springer*, 2: 217-52.

190. Dietrich, M., Heinze, J., Heywang, G., Jonas, F. (1994). Electrochemical and spectroscopic characterization of polyalkylenedioxythiophenes. *J. Electroanal. Chem,* 87:369.

191. Im, S.G., and Gleason, K. K. (2007). Systematic Control of the Electrical Conductivity of Poly(3,4-ethylenedioxythiophene) via Oxidative Chemical Vapor Deposition. *Macromolecules* 40, 18:6552-6556.

192. Kaur, G., Adhikari, R.,Cass, P., Bown, M., and Gunatillake, P. (2015). Electrically conductive polymers and composites for biomedical applications. *RSC Adv*., 5:37553-37567.

193. Xiao, Y., Cui, X., Martin, D.C. (2004). Electrochemical polymerization and properties of PEDOT/S-EDOT on neural microelectrode arrays. *Journal of Electroanalytical Chemistry.,* 573:43-48.

194. Purohit, P.J., Sanche, J.H., Wang, D.Y., Emmerling, F., Thunemann, A., Heinrich, G., and Schonhals, A. (2011). Structure–Property Relationships of Nanocomposites Based on Polypropylene and Layered Double Hydroxides *Macromolecules*. 44:4342-4354.

195. Keisham, R., Khan, R. (2014). Amperometric immunosensor for detection of toxin aflatoxin b1 based on polyaniline probe modified with Mc- IgGs-a-AFB1 antibodies. *Adv. Mater. Lett,* 5:435-440.

196. Algul, I., Kara, D. (2014). Determination and chemometric evaluation of total aflatoxin, aflatoxin B1, ochratoxin A and heavy metals content in corn flours from Turkey. *Food Chem*, 157:70-76.

197. Wang, Z., Gao, W.W., Chen, J., Yang, M.H., Kuang, Y., Huang, L.F., Chen, S.L. (2013). Simultaneous determination of aflatoxin B1 and ochratoxin A in licorice roots and fritillary bulbs by solid-phase extraction coupled with high-performance liquid chromatography-tandem mass spectrometry. *Food Chem,* 138 (2):1048-1054.

198. Nonaka, Y., Saito, K., Hanioka, N., Narimatsu, S., Kataoka, H. (2009). Determination of aflatoxins in food samples by automated on-line in-tube solid-phase microextraction coupled with liquid chromatography-mass spectrometry. *Journal of Chromatography A*, 1216:4416-4422.

199. Saraswathi, R., Gerard, M., Malhotra, B.D. 1999. Characteristics of aqueous polycarbazole batteries. *Journal of applied polymer science*, 74:145-150.

200. Jaimez, J., Fente, C. A., Vazquez, B. I., Franco, C.M., Cepeda, A., Mahuzier, G. (2000). Application of the assay of aflatoxins by liquid chromatography with fluorescence detection in food analysis. *Journal of Chromatography A,*882:1–2.

201. Ricci, F., Volpe, G., Micheli, L., & Palleschi, G. (2007). A review on novel developments and applications of immunosensors in food analysis. *Analytica Chimica Acta,* 605(2):111-129.

202. Mitch, T., Robbins, M.E., Catt, M.K., Cody, P., Happe, C., Cui, X.T. (2017). Enhanced dopamine detection sensitivity by PEDOT/graphene oxide coating on in vivo carbon fiber electrodes. *Biosensors and Bioelectronics*, 89 (1):400-410.

203. Yoon, H. (2013). Current Trends in Sensors Based on Conducting Polymer Nanomaterials. *Nanomaterials*, 3:524-549.

204. Roh, E., Hwang, B.U., Kim, D., Kim, B.Y., Lee, N.E. (2015). Stretchable, Transparent, Ultrasensitive, and Patchable Strain Sensor for Human-Machine Interfaces Comprising a Nanohybrid of Carbon Nanotubes and Conductive Elastomers. *ACS Nano*, 9:6252–6261.

205. Vreeland, R.F., Atcherley, C.W., Russell, W.S., Xie, J.Y., Lu, D., Laude, N.D., Porreca, E., Heien, M.L. (2015). Biocompatible PEDOT:Nafion Composite Electrode Coatings for Selective Detection of Neurotransmitters in Vivo. *Anal. Chem.*, 87:2600-2607.

206. Ni. H., Wenting, W., Guiyun, X., Xiliang, L. (2015). Graphene oxide doped poly(3,4-ethylenedioxythiophene) modified with copper nanoparticles for high performance nonenzymatic sensing of glucose. *J. Mater. Chem.,* B, 3:556–561.

207. Wang, W.T., Xu, G.Y., Cui, X.T., Sheng, G., and Luo, X.L. (2014). Enhanced catalytic and dopamine sensing properties of electrochemically reduced conducting polymer nanocomposite doped with pure graphene oxide. *Biosensor & Bioelectronics.,*58 C:153.

208. Haihan, Z., Zhai, H.J., Gaoyi, H. (2016). Superior performance of highly flexible solid-state supercapacitor based on the ternary composites of graphene oxide supported poly(3,4-ethylenedioxythiophene)-carbon nanotubes. *Journal of Power Sources* 2016, 323:125-133.

209. Cao, J.Y., Wang, Y.M., Chen, J.C., Li, X.H., Walsh, F.C., Ouyang, J.H.; Jia, D.C. (2015). Three-dimensional graphene oxide/polypyrrole composite

electrodes fabricated by one-step electrodeposition for high performance supercapacitors. *J. Mater. Chem. A*, 3:14445-14457.

210. Jung, J.H., Cheon, D.S., Liu, F., Lee, K.B., Seo, T.S. (2010). A Graphene Oxide Based Immuno-biosensor for Pathogen Detection. *Angew. Chem. Int. Ed*.49:5708 –5711.
211. Yoon, H., Chang, M., and Jang, J. (2005). Chemical Sensors Based on Highly Conductive Poly (3,4-ethylenedioxythiophene) Nanorods. *Adv. Mater.*,17:1616-1620.
212. Wang, Z.J., Zhou, X.Z., Zhang, J., Boey, F., Zhang, H. (2009). Direct Electrochemical Reduction of Single-Layer Graphene Oxide and Subsequent functionalization with Glucose Oxidase. *The Journal of Physical Chemistry C*,113: 14071–14075.
213. Xu, W., Reinhard, N., Dianping, T. (2016). Nanoparticle-based immunosensors and immunoassays for aflatoxins. *Analytica Chimica Acta*, 912:10-23.
214. Saxena, U., Chakraborty, M., Goswami, P. (2011). Covalent immobilization of cholesterol oxidase on self-assembled gold nanoparticles for highly sensitive amperometric detection of cholesterol in real samples. *Biosensors and Bioelectronics,* 26, 3037-3043.
215. Radhapyari K., Kotoky P., Das R., Khan R. (2013). Graphene-polyaniline nanocomposite based biosensor for detection of antimalarial drug artesunate in pharmaceutical formulation and biological fluids. (2013). *Talanta*, 111:47–53.
216. Das M., Goswami P. (2013). Direct electrochemistry of alcohol oxidase using multiwalled carbon nanotube as electroactive matrix for biosensor application. *Bioelectrochemistry,* 89:19-25.
217. Moreira, F., Sharma, S., Dutra, R., Noronha, J., Cass, A., Sales, M. (2015). Detection of cardiac biomarker proteins using a disposable based on a molecularly imprinted polymer grafted onto graphite. *Microchimica Acta* 182:975-983.
218. Betty, C.A. (2016). Gas Adsorption Characterization of Ordered Organic−Inorganic Nanocomposite Materials. *Materials Science and Technology*. 32:1-5.
219. Wang, X., Niessner, R., Tang, D., Knopp, D., Nanoparticle-based immunosensors and immunoassays for aflatoxins. *Analytica Chimica Acta*, 912, 2016, 10-23.

220. Kaur, N., Thakur, H., Prabhakar,N.,Conducting polymer and multi-walled carbon nanotubes nanocomposites based amperometric biosensor for detection of organophosphate. *Journal of Electroanalytical Chemistry* 775, 2016,121–128.

221. Barsoukov, E., and Macdonald, J.R. (2005). Impedance Spectroscopy: Theory, Experiment, and Applications, Eds., *Wiley-Interscience*.

222. Orazem, M.E.,Tribollet, B. (2011). Electrochemical Impedance Spectroscopy, *John Wiley & Sons.*

223. Bard, A.J., Faulkner, L.R. (2000). Electrochemical Methods; Fundamentals and Applications, *Wiley Interscience Publications.*

224. Loveday, D., Peterson, P., and Rodgers, B. (2004) Evaluation of Organic Coatings with Electrochemical Impedance Spectroscopy, 46-52.

225. Chang, B.Y., and Park, S.M. (2010). Electrochemical Impedance Spectroscopy.Annu. Rev. *Anal. Chem*, 3:207–29.

226. Randles, J.E.B. (1947). Kinetics of rapid electrode reactions. *Discuss. Faraday Soc*, 1: 11–19.

227. Park, S.M., Yoo, J.S. (2003). Electrochemical impedance spectroscopy for better electrochemical measurements. *Anal. Chem,* 75:A455–81.

228. Geenen. F. (1990). Characterization of Organic Coatings with Impedance Measurements; A study of Coating Structure, Adhesion and Underfilm Corrosion, Ph-D thesis, Delft University of Technology.

229. Stern, M., and Geary, A.L. (1957). Electrochemical polarisation, I. A theoretical analysis of the shape of polarisation curves. *J. Electrochem. Soc*, 104:56-63.

230. Wang, L., Zhao, J., and Xiangming, H., Gao, J., Li, J., Wan, C., Jiang, C. (2012). Electrochemical Impedance Spectroscopy (EIS) Study of LiNi1/3Co1/3Mn1/3O2 for Li-ion Batteries. *Int. J. Electrochem. Sci*, 7:345 – 353.

231. Ferlauto, S. (2012). "Electrochemical impedance Modeling., Joint School of Nanoscience & Nanoengineering" • RICE International REU.

232. Monthei, D.L. (1999). *Package Electrical Modeling, Thermal Modeling, and Processing for Gaas Wireless Applications*, Kluwer Academic Publishers, 45-61.

233. Orazem, M.E., and Tribollet, B. (2008). Electrochemical Impedance Spectroscopy. Hoboken, NJ: *John Wiley & Sons*.

234. Schmickler, W. (1996). *Interfacial Electrochemistry* ; Oxford University Press: Oxford.

235. Vyas, R., Li, K., and Wang, B. (2010). Modifying Randles Circuit for Analysis of Polyoxometalate Layer-by-Layer Films, *J. Phys. Chem. B*, 114: 15818–15824.

236. Heinze, J. (1984). Cyclic Voltammetry—"Electrochemical Spectroscopy". New Analytical Methods, 23: 831-847.

237. Sevcik, A. (1948). Oscillographic polarography with periodical triangular voltage. *Coll. Czech. Chem. Commun.,* 13:349-347.

238. Randies.,J.E.B. (1948). A cathode ray polarograph. *Trans. Faraday Soc,* 44:322.

239. Nicholson, R. (1965). Theory and Application of Cyclic Voltammetry for Measurement of Electrode Reaction Kinetics, 37:11.

240. Bard, A.J., Faulkner, L.R. (2001). Electrochemical Methods: Fundamentals and Applications, 2nd edition. (*Wiley, New York*).

241. Chatterji, S. (1995). On the applicability of Fick's second law to chloride ion migration through portland cement concrete, 25:299-303.

242. Gene, R., Aaron, I. (1954). Faraday's Electrochemical Laws and the Determination of Equivalent Weights. *Journal of Chemical Education*, 31: 226–232.

243. Lim, H.S., Barclay, D.J., Anson, F.C. (1972). Formal potentials and cyclic voltammetry of some ruthenium-ammine complexes. *Inorg. Chem*, 11:1460-1466.

244. Rock, P.A. (1966). The Standard Oxidation Potential of the Ferrocyanide Ferricyanide Electrode at 25°C and the Entropy of Ferrocyanide Ion. *J. Phys. Chem*, 70:576-580.

245. Xiao, Y., Han, G., Li, Y., Li, M., Lin, J. (2015). Three-dimensional hollow platinum-nickel bimetallic nanoframes for use in dye-sensitized solar cells. *J. Power Sources*, 278 -149.

246. Aristov, N., Habekost, A. (2015). Cyclic Voltammetry - A Versatile Electrochemical Method Investigating Electron Transfer Processes. *World Journal of Chemical Education,*3:115-119.

247. Reinmuth, W. H. (1968). Electrochemical relaxation techniques. *Anal. Chem.,* 1968, 40 (5):185–194

248. Pickup, P.G., Kuo, K.N., and Murray, R.W. (1983). Electrodeposition of Metal Particles and Films By A Reducing Redox Polymer. *Electrochem. Soc,* 130**:**2205.

249. Srinivasan, S., and Gileadi, E. (1966). The potential-sweep method: A theoretical analysis. *Electrochim. Acta,* 11**:**321.

250. Conway, B.E. (1965). Theory and Principles of Electrode Processes, Ronald, New York, 1965, Chaps. 4 and 5.

251. VanLoon, G., Duffy, S. (2011). *Environmental Chemistry - a global perspective* (3rd ed.). Oxford University Press, 235:248.

252. Vernik, E.D. (2000). Simplified Procedure for Constructing Pourbaix Diagrams. *John Wiley & Sons, Inc.*

253. Brookins, D.G. (1988). *Eh-pH diagrams for geochemistry*, Springer-Verlag New York, 176.

254. Laviron, E., (1979). General expression of the linear potential sweep voltammogram in the case of diffusionless electrochemical systems.*j. Electroanal. Chem.,* 101:19-28.

255. Laviron, E. (1974). Adsorption, autoinhibition and autocatalysis in polarography and in linear potential sweep voltammetry. *J. Electroanal. Chem*, 52:355.

256. Laviron, E. (1975). A critical study of the factors causing the appearance of Brdička's adsorption currents: Influence of the interactions between the adsorbed molecules. *J. Electroanal. Chem,* 63:245.

257. Laviron, E. (1972). Theoretical study of a reversible reaction followed by a chemical reaction in thin layer linear potential sweep voltammetry. *J. Electroanal. Chem,39:1-23.*

258. Laviron, E. (1983).Theoretical study of the kinetics of the homogeneous ee electrochemical reaction. *J. Electroanal. Chem,* 148:1-16.

259. Laviron, E. (1978). Theory of regeneration mechanisms in thin layer potential sweep voltammetry. *J. Electroanal. Chem,87:31-37.*

260. Laviron, E. (1974). General expression of the linear potential sweep voltammogram in the case of diffusionless electrochemical systems. *J. Electroanal. Chem,* 101:979.

261. Wip, D., Kristensen, W.E., Deakin, R., and Wightman, R.M. (1988). Fast-Scan Cyclic Voltammetry as a Method To Measure Rapid, Heterogeneous Electron-Transfer Kinetics, *Anal. Chem,*60:306-310.

262. Heinze, J. (1984). Cyclic Voltammetry-"Electrochemical Spectroscopy", 23: 831-918.

263. Lemmer, C., Bouvet, M., and Meunier-Prest, R. (2011). Proton coupled electron transfer of ubiquinone Q2 incorporated in a self-assembled monolayer, *Phys. Chem. Chem. Phys*, 13:13327–13332.

264. IUPAC. 1979. Electrode reaction orders, transfer coefficients and rate constants. Application of definitions and recommendations for publication of parameters. *Pure & Appi. Chern.,*52:233—240.

265. Cornish, A., and Wharton, C.W. (1988). *Enzyme Kinetics.* Oxford: IRL Press.

266. Michaelis, L., Menten, M.L. (1913). Die Kinetik derInvertinwirkung, *Biochem Z,* 49:333–3.

267. Lehninger, A.L. (2006). *Biochemistry*, Kalyani Publishers, New Delhi.

268. Bisswanger H, Enzyme Kinetics, Principles and Methods, WILEY-VCH (2002).

269. Chang, Raymond. (2005). *Physical Chemistry for the Biosciences*. Sansalito, CA: University Science, 363-371.

270. Kamin, R.A.,Wilson, G.S. (1980). Rotating ring-disk enzyme electrode for biocatalysis kinetic studies and characterization of the immobilized enzyme layer. *Anal. Chem,* 52: 1198–1205.

271. Staros, J. V., Wright, R. W., and Swingle, D. M. (1986). Enhancement by N-hydroxysulfosuccinimide of water-soluble carbodiimide-mediated coupling reactions. *Anal. Biochem*, 156:220–222.

272. Sehgal, D., and Vijay, I. K. (1994). A method for the high efficiency of water-soluble carbodiimide-mediated amidation, *Anal. Biochem*. 218:87–91.

273. Sharma, A., Kumar, A., Khan, R. (). Electrochemical immunosensor based on poly (3,4-ethylenedioxythiophene) modified with Gold nanoparticle to detect aflatoxin B1., *Materials Science & Engineering C.*

274. Peng, S., Zou, G., and Zhang, X. (2012). Nanocomposite of electrochemically reduced graphene oxide and gold nanoparticles enhanced electrochemilunescence of peroxydisulfate and its immunosensing abililty towards human IgG, *Journal of Electroanalytical Chemistry*,686: 25-31.

275. Huang, W. J., Taylor, S., Fu, K. F., Lin, Y., Zhang, D. H., Hanks, T. W., Rao, A. M., and Sun, Y. P. (2002). Attaching proteins to carbon nanotubes via diimide-activated amidation, *Nano Lett.*, 2:311–314.

276. Radhapyari, K., Kotoky, P., and Khan, R. (2013). Detection of anticancer drug tamoxifen using biosensor based on polyaniline probe modified with horseradish peroxidase, *Materials Science and Engineering: C*, 33:583-587.

277. Y. Du, X.L., Luo, J.J, Xu., H, Chen. (2007). A simple method to fabricate a chitosan-gold nanoparticles film and its application in glucose biosensor. *Bioelectrochemistry* ,70:342-347.

278. Cui, M., Song, Z., Wu, Y., Guo, B., Fan, X., and Luo, X. (2016). A highly sensitive biosensor for tumor maker alpha fetoprotein based on poly(ethylene glycol) doped conducting polymer PEDOT, *Biosensors and Bioelectronics*, 79:736-741.

279. Weaver, C.L., Li, H., Luo, X., Cui, X.T.(2014). A graphene oxide/conducting polymer nanocomposite for electrochemical dopamine detection: origin of improved sensitivity and specificity, *J. Mater. Chem. B* 2 (32):5209–5219.

280. Luo, X.L., Weaver, C.L., Tan, S.S., Cui, X.T. (2013). Pure graphene oxide doped conducting polymer nanocomposite for bio-interfacing, *J. Mater. Chem. B* 1 (9):1340–1348.

281. Sharma, A., Kumar, A., and Khan, R. (2018). A highly sensitive amperometric immunosensor probe based on gold nanoparticle functionalized poly (3, 4-ethylenedioxythiophene) doped with graphene oxide for efficient detection of aflatoxin B1, *Synthetic Metals,* 235:136-144.

282. Yuqi, Y., Asiri, M., and Yue, L. (2014). Acetylcholinesterase biosensor based on a gold nanoparticle–polypyrrole–reduced graphene oxide nanocomposite modified electrode for the amperometric detection of organophosphorus pesticides. *Analyst*,139:3055–3060.

283. Wang, W., Davis, J., and Luo, X. (2015). Ultrasensitive and selective voltammetric aptasensor for dopamine based on a conducting polymer nanocomposite doped with graphene oxide. *Microchim Acta*, 182:1123–1129.

284. Du, D., Wang, M.H., Cai, J., Qin, Y.H., and Zhang, A.D. (2010). One-step synthesis of multiwalled carbon nanotubes-gold nanocomposites for fabricating amperometric acetylcholinesterase biosensor. *Sens. Actuators, B,* 143:524–529.

285. Tengvall, P., Jansson, E., Askendal, A., Thomsen, P., and Gretzer, C. (2003). Preparation of multilayer plasma protein films on silicon by EDC/NHS coupling chemistry. *Colloids and Surfaces B: Biointerfaces*,28(4):261-272.

286. Ahirwal, G. K., Mitra, C.K. (2010). (Gold nanoparticles based sandwich electrochemical immunosensor). *Biosensors and Bioelectronics*., 25: 2016-2020.

287. Milán. R., Marzán. L.M. (2014). Gold nanoparticle conjugates: recent advances toward clinical applications. *Expert Opin. Drug Deliv*,11 (5) :741–752.

288. Ljungblad. L. (2009). Antibody-Conjugated Gold Nanoparticles Integrated in a Fluorescence Based Biochip.

289. Kumar. S., Aaron. K. (2008). Directional conjugation of antibodies to nanoparticles for synthesis of multiplexed optical contrast agents with both delivery and targeting moieties. *Nat. Protoc,* 3 (2):314–320.

290. Chen. Z., Peng. Z., Zhang. P., Jin. X., Jiang. J., and Zhang. X. (2007). A sensitive immunosensor using colloidal gold as electrochemical label. *Talanta* 72 (5):1800–1804.

291. Yu. M.K., Park. J., and Jon. S. (2012). Targeting strategies for multifunctional nanoparticles in cancer imaging and therapy. *Theranostics* 2 (1):3.

292. Jazayeri. M., Amani. H., Akbar. A., Toroudi. H., Sedighimoghaddam. B. (2016). Various methods of gold nanoparticles (GNPs) conjugation to antibodies. *Sensing and Bio-Sensing Research,* 9:17–22.

293. Saghaei. J., Fallahzadeh. A., and Saghaei. T. (2015). ITO-free organic solar cells using highly conductive phenol-treated PEDOT:PSS anodes. *Organic Electronics*, 24:188-194.

294. Le, V.T., Ngo, C.L., Le, Q.T., Ngo. T.T. Nguyen, D.N. (2013). Surface modification and functionalization of carbon nanotube with some organic compounds., *Adv. Nat. Sci.: Nanosci. Nanotechnol.* 4: 035017.

295. Arduini, F., Errico, I., Amine, A., Micheli, L., Palleschi, G., Moscone, D. (2007) Enzymatic Spectrophotometric Method for Aflatoxin B Detection Based on Acetylcholinesterase Inhibition. *Anal. Chem*, 79 (9):3409–3415.

296. Maa. H., Sun. J., Zhang. Y., Bian. C., Xia. S., and Zhen. T. (2016). Label-free immunosensor based on one-step electrodeposition of chitosan-gold nanoparticles biocompatible film on Au microelectrode for determination of aflatoxin B1 in maize,*Biosensors & Bioelectronics,* 80:222-229.

297. Polatoglu, I., Yurekli, Y., Başturk, S.B. (2015). Estimating Solubility of Parathion in Organic Solvents. *J. Sci. Eng*.15:037101 (1-5).
298. Chang . P.L., Hsieh, M.M.,and Chiu, T.C. (2016). Recent Advances in the Determination of Pesticides in Environmental Samples by Capillary Electrophoresis., *Int. J. Environ. Res. Public Health*,13:409.
299. Green. A.A. (1933). The Preparation of Acetate and Phosphate Buffer Solutions of Known Ph and Ionic Strength. *Journal of the American Chemical Society*, 55: 2331-2336.
300. Pawley. J. (1997). the development of field-emission scanning electron microscopy for imaging biological surfaces. *Scanning*,19(5):324-36.
301. Stranks. D. R., Heffernan. M.L., Dow. K.C., McTigue. P.T. (1970). G. R. A. Withers, *Chemistry: A structural view*. Carlton, Victoria Melbourne University Press.
302. Arthur Beiser. (1965). Concept of modern physics, McGraw-Hill, Inc, 1995 H.M. Smith and A.F. Turner. Appl. Opt. 4:147.
303. Kuo., J.,Totowa, N.J. (2007). *Electron microscopy:methods and protocols.* 2nd edition, Humana Press. (Methods in molecular biology ; 369).
304. McMullan. D. (1995). Scanning electron microscopy 1928–1965, *Scanning: The Journal of Scanning Microscopies.,*17(3):175-185.
305. Young, T. An assay on the cohesion of fluids, *Philos. Trans. R. Soc. London* **95**, 65-87, 1805.
306. Bacsik, Z., Mink, J., Keresztury, G. (2004). FTIR Spectroscopy of the Atmosphere. I. Principles and Methods., *Applied Spectroscopy Reviews*, 39:3:295-363.
307. Kirk T.KawagoeJayne B.ZimmermanR.MarkWightman., Principles of voltammetry and microelectrode surface states., Journal of Neuroscience Methods Volume 48, Issue 3, July 1993, Pages 225-240.
308. Chauhan, R., Singh, J., Sachdev, T., Basu, T., Malhotra, B.D. (2016). Recent advances in mycotoxins detection. *Biosensors and Bioelectronics*, 81:532–545.
309. Robbins, C.A., Swenson, L.J., Nealley, M.L., Kelman, B.J., Gots, R.E. (2000). Health Effects of Mycotoxins in Indoor Air: A Critical Review. *Appl. Occup.Environ. Hyg,*15:773–784.

310. Khayoon, W.S., Saad, B., Yan, C.B., Hashim, N.H., Ali, A.S.M., Salleh, M.I., Salleh, B. (2010). Determination of aflatoxins in animal feeds by HPLC with multifunctional column clean-up. *Food Chemistry*, 118:882–886.

311. Kirsch,J., Siltanen, C., Zhou, Q., Revzin, A., Simonian, A. (2013). Biosensor technology: recent advances in threat agent detection and medicine. *Chem. Soc. Rev*, 42:8733–8768.

312. Constantine, C.A., Mello, S.V., Dupont, A., Cao, X., Santos, D., Oliveira, O.N., Strixino, F.T., Pereira, E.C., Cheng, T.C., Defrank, J.J., Leblanc, R.M. (2003). Layer-by-layer self-assembled chitosan/poly(thiophene-3-acetic acid) and organophosphorus hydrolase multilayers. *J. Am. Chem. Soc,* 125:1805–1809.

313. Zhou, L., Zhang, X., Ma. L., Gao, Yanjun Jiang, Y. (2017). Acetylcholinesterase/chitosan-transition metal carbides nanocomposites-based biosensor for the organophosphate pesticides detection. *Biochemical Engineering Journal.*,128:243-249.

314. Du, D., Chen, S.Z., Cai, J., Zhang, A.D. (2007). Immobilization of acetylcholinesterase on gold nanoparticles embedded in sol-gel film for amperometric detection of organophosphorous insecticide. *Biosens. Bioelectron,* 23:130–134.

315. Beck, J., Sherman, M.(1990). Detection by Thin-Layer Chromatography of Organophosphorus Insecticides in Acutely Poisoned Rats and Chickens. *acta pharmacol*, 26:35-40.

316. Lin, L., Zhang, J., Wang, P., Wang, Y., Chen, J. (1998). Thin-layer chromatography of mycotoxins and comparison with other chromatographic methods. *Journal of Chromatography A*, 815: 3-20.

317. Lippolis, V., Pascale, M., Maragos, C.M., Visconti, A. (2008). Improvement of detection sensitivity of T-2 and HT-2 toxins using different fluorescent labeling reagents by high-performance liquid chromatography. *Talanta*, 74: 1476–1483.

318. Vidal, J.C., Bonel, L., Ezquerra, A., Hernandez, S., Bertolin, J.R., Cubel, C., Castillo, J.R.(2013). Electrochemical affinity biosensors for detection of mycotoxins: A review. *Biosens. Bioelectro,*. 49:146–158.

319. Cappielo, A., Famiglini, G., Palma, P., Mangani, F.(2002). Trace Level Determination of Organophosphorus Pesticides in Water with the New Direct-Electron Ionization LC/MS Interface. *Anal. Chem*.,74: 3547–3554.

320. Wang, J., Chow, W., Leung, D., Chang, J. (2012). Application of ultrahigh-performance liquid chromatography and electro spray ionization quadrupole orbit high resolution mass spectrometry for determination of 166 pesticides in fruits and vegetables. *J. Agric. Food Chem,* 60: 12088–12104.

321. Trucksess, M.W., , Brumley, W.C., Nesheim, S .(1984). Rapid quantitation and confirmation of aflatoxins in corn and peanut butter, using a disposable silica gel column, thin layer chromatography, and gas chromatography/mass spectrometry. *Journal - Association of Official Analytical Chemists,* 67:973-975.

322. Stanley, C.W., Morrison J.I. (1969). Identification of organophosphate pesticides by gas chromatography with the flame photometric detector. *Journal of Chromatography A,* 40: 289-293.

323. Ibanez, V.F., Soldado, A., Fernandez, A.M., Delgado. D.L. (2009). Application of near infrared spectroscopy for rapid detection of aflatoxin B1 in maize and barley as analytical quality assessment. *Food Chemistry*,113:629-634.

324. Guodong, L., Wang, J., Barry. R., Petersen, C., Timchalk, C., Paul, C., Gassman, L.,Yuehe Lin, Y. (2008). Nanoparticle-Based Electrochemical Immunosensor for the Detection of Phosphorylated Acetylcholinesterase: An Exposure Biomarker of Organophosphate Pesticides and Nerve Agents. *Chem. Eur. J*, 14: 9951-9959.

325. Edupuganti, S.R., Edupuganti, O.P., Hearty, S., Kennedy, R. (2013). A highly stable, sensitive, regenerable and rapid immunoassay for detecting aflatoxin B1 in corn incorporating covalent AFB immobilization and a recombinant F antibody, *Talanta,* 115: 329–335.

326. Erhard. M.H., Schmidt, P., Kuhlmann, R., Losch, U. (1989). Development of an ELISA for detection of an organophosphorus compound using monoclonal antibodies, *Arch Toxicol*, 63: 462-468.

327. Bagheri, H., Afkhami, A., Khoshsafar, H., Hajian, A., Shahriyari, A. (2017). Protein capped Cu nanoclusters-SWCNT nanocomposite as a novel candidate of high performance platform for organophosphates enzymeless biosensor, *Biosensors and Bioelectronics*,89:829–836.

328. Shephard, G.S. (2009). Aflatoxin analysis at the beginning of the twenty-first century, *Anal. Bioanal. Chem,* 395:1215-1224.

329. Kappor, M., Rajagopal, R. (2011). Enzymatic bioremediation of organophosphorus insecticides by recombinant organophosphorous hydrolase, *Int. Biodeterior. Biodegrad,* 65: 896–901.

330. Vidal, J.C., Bonel, L., Ezquerra, A., Hernandez, S., Bertolin, J.R., Cubel, C., Castillo, J.R. (2013). Electrochemical affinity biosensors for detection of mycotoxins: A review. *Biosens. Bioelectron*, 49:146–158.

331. Ricci, F., Volpe, G., Micheli, L., Palleschi, G. (2007). A review on novel developments and applications of immune sensors in food analysis, *Analytic Chimica Acta*, 605:111–129.

332. Sinha, R., Ganesana, M., Andreescu, S., Stanciu, L. (2010). AChE biosensor based on zinc oxide sol–gel for the detection of pesticides, *Anal. Chim. Acta*, 661:195-199.

333. Chauhan, N., Pundir, C.S. (2011). An amperometric biosensor based on acetylcholinesterase immobilized onto iron oxide nanoparticles/multi-walled carbon nanotubes modified gold electrode for measurement of organophosphorus insecticides, *Anal. Chim. Acta*,701: 66–74.

334. Vamvakaki, V., Fournier, D., Chaniotakis, N.A. (2005). Fluorescence detection of enzymatic activity within a liposome based nano-biosensor, *Biosens. Bioelectron,* 21: 384–388.

335. Cui, M., Song, Z., Wu, Y., Guo, B., Fan, X., Luo, X. (2016). A highly sensitive biosensor for tumor maker alpha fetoprotein based on poly(ethylene glycol) doped conducting polymer PEDOT, *Biosensors and Bioelectronics*, 79:736–741.

336. Ronkainen, N.J., Halsall, H.B., Heineman, W.R. (2010). Electrochemical biosensors.,*Chem. Soc. Rev*., 39:1747-1763.

337. Lopez, B.P., Merkoci, A. (2011). Nanoparticles for the development of improved (bio) sensing systems, *Anal. Bioanal. Chem,* 399: 1577-1590.

338. Du, D., Ye, X., Cai, J., Liu, J., Zhang, A. (2010). Acetylcholinesterase biosensor design based on carbon nanotube-encapsulated polypyrrole and polyaniline copolymer for amperometric detection of organophosphates, *Biosensors and Bioelectronics,* 25: 2503–2508.

339. Taylor, I, M., Robbins, E.M., Catt, K.A., Cody, P.A., Cassandra L. Happe, C.L., Cui, X. T. (2017). Enhanced dopamine detection sensitivity by PEDOT/graphene oxide coating on in vivo carbon fiber electrodes, *Biosensors and Bioelectronics,*89:400-410.

340. Reddy, L.H., Arias, J.L., Nicolas, J., Couvreur, P. (2012). Magnetic nanoparticles: design and characterization, toxicity and biocompatibility, pharmaceutical and biomedical applications, *Chem. Rev,* 112: 5818-5878.

341. Tang, D., Cui, Y.,Chen, G. (2013). Nanoparticle-based immunoassays in the biomedical field, *Analyst* 138:981-990.

342. Kokkinos, C., Prodromidis, M., Economou, A., Petrou, P., Kakabakos, S. (2015). Quantum dot-based electrochemical DNA biosensor using a screen-printed graphite surface with embedded bismuth precursor, *Electrochemistry Communications,*60:47-51.

343. Mathelié-Guinlet, M., Gammoudi, I., Beven, L., Morote, F., Delville, M., C.G. (2016). Silica Nanoparticles Assisted Electrochemical Biosensor for the Detection and Degradation of Escherichia Coli Bacteria., *Procedia Engineering*,168: 1048-1051.

344. Boisselier, E., Astruc, D. (2009). Gold nanoparticles in nanomedicine: preparations, imaging, diagnostics, therapies and toxicity, *Chem. Soc. Rev,* 38: 1759–1782.

345. Perez-Juste, J., Pastoriza-Santos, I., Liz-Marzan, L.M., Mulvaney, P. (2005). Gold nanorods: Synthesis, characterization and applications. *Coord. Chem.Rev,* 249:1870–1901.

346. Dykman, L., Khlebtsov, N. (2012). Gold nanoparticles in biomedical applications: recent advances and perspectives, *Chem. Soc. Rev,* 41:2256-2282.

347. Sun, J., Xianyu, Y., Jiang, X. (2014). Point-of-care biochemical assays using gold nanoparticle-implemented microfluidics, *Chem. Soc. Rev,* 43:6239-6253.

348. Boca, S.C., Potara, M., Gabudean, A., Juhem, A., Baldeck, P.L., Astilean, S. (2011). Chitosan-coated triangular silver nanoparticles as a novel class of biocompatible, highly effective photothermal transducers for *in vitro* cancer cell therapy**,** *Cancer Lett*, 311:131–14.

349. Vasantha, V., Chen, S.M.(2006). Electrocatalysis and simultaneous detection of dopamine and ascorbic acid using poly(3,4-ethylenedioxy) thiophene film modified electrodes. *J. Electroanal. Chem*. 592:77–87.

350. Hui, N., Wang, W.T., Xu, G.Y., Luo, X.L. (2015). Graphene oxide doped poly(3,4-ethylenedioxythiophene) modified with copper nanoparticles for high performance nonenzymatic sensing of glucose, *J. Mater. Chem. B*, 3: 556–561.

351. Wang, W., Wang, W., Davis, J., Luo, X. (2015). Ultrasensitive and selective voltammetric aptasensor for dopamine based on a conducting polymer nanocomposite doped with graphene oxide, *Microchim. Acta*,182:1123–1129.

352. Xia, X., Xiangjiang, L., Yanbin, L., Ying, Y. (2013). A simple and rapid optical biosensor for detection of aflatoxin B1 based on competitive dispersion of gold nanorods, *Biosensors and Bioelectronics,*47:361–367.

353. Alemu, D., Wei, H.Y., Ho, K.C., Chu, C.W. (2012). Highly conductive PEDOT:PSS electrode by simple film treatment with methanol for ITO-free polymer solar cells, *Energy Environ. Sci,* 5: 9662–9671.

354. Cui, M., Song, Z., Wu, Y., Guo, B., Fan, X., Luo, X. (2016). A highly sensitive biosensor for tumor maker alpha fetoprotein based on poly(ethylene glycol) doped conducting polymer PEDOT, *Biosensors and Bioelectronics*,79:736–741.

355. Giorno, L., Bartolo, L.D., Drioli, E. (2003). Membrane bioreactors for biotechnology and medical applications, *Membrane Science and Technology*, 8:187-217.

356. Selvaganesh, S.V., Mathiyarasu, J., Phani, L.N., Yegnaraman, V. (2007). Chemical Synthesis of PEDOT–Au Nanocomposite, *Nanoscale Res Lett* , 2: 546–549.

357. Xiong, S., Zhang, L., Lu, X. (2013). Conductivities enhancement of poly(3,4-ethylenedioxythiophene)/poly(styrene sulfonate) transparent electrodes with diol additives, *Polym Bull*,70: 237–247.

358. Singh, C., Srivastava, S., Ali, M.A., Gupta, T.K., Sumana, G., Srivastava, A., R.B Mathur, R.B., Malhotra, B.D. (2013). Carboxylated multiwalled carbon nanotubes based biosensor for aflatoxin detection, *Sensor.Actuat.B-Chem*,185: 258–264.

359. Du, D., Ding, J., Cai, J., Zhang, A. (2007) One-step electrochemically deposited interface of chitosan–gold nanoparticles for acetylcholinesterase biosensor design, *J. Electroanal.Chem,* 605: 53–60.

360. Park, S.M., Yoo, J.S. (2000) An Electrochemical Impedance Measurement Technique Employing Fourier Transform, *Analytical chemistry,*72:2035-2041.

361. Andreas, E., Stephan, K., Wilfried, L., Udo, M., Knud, R. (2010). PEDOT: Principles and Applications of an Intrinsically Conductive Polymer, *CRC press, Taylor and Franchise groups,* 67-79.

362. Ahirwal, G.K., Mitra, C.K. (2010) Gold nanoparticles based sandwich electrochemical immunosensor, *Biosensors and Bioelectronics*, 25: 2016–2020.

363. Spain, E., Keyes, T.E., Forster, R.J. (2013) DNA sensor based on vapour polymerised pedot films functionalised with gold nanoparticles, *Biosensors and Bioelectronics,*41: 65-70.

364. Haihu, M., Jizho, S., Yuan, Z., Chao, B., Shanhong, X., Tong, Z. (2016) Label--step electro deposition of chitosan-gold nanoparticles biocompatible film on Au microelectrode for determination of aflatoxin B1 in maize, *Biosensors and Bioelectronics*, 80:222–229.

365. Khan, R., Dey, C.N., Hazarika, K.A. (2011) Krishan, K.S., Marshal, D., Mycotoxin detection on antibody-immobilized conducting polymer-supported electrochemically polymerized acacia gum. *Analytical Biochemistry*,410: 185–190.

366. Mabbott, G.A. (1983). An introduction to cyclic voltammetry, *J. Chem. Educ,*60:697.

367. Pereira, V.L., Fernandes, J.O., Cunha, S.C. (2014). Mycotoxins in cereals and related foodstuffs: A review on occurrence and recent methods of analysis, *Trends Food Sci. Tech,* 36: 96-136.

368. Bradburn, N., Coker, R.D., Jewers, K., Tomlins, K.I. (1990). Evaluation of the ability of different concentrations of aqueous acetone, aqueous methanol and aqueous acetone: Methanol (1:1) to extract aflatoxin from naturally contaminated maize, *Chromatographia*, 29: 435–440.

369. Dutta, R.R., Puzari, P. (2014). Amperometric biosensing of organophosphate and organocarbamate pesticides utilizing polypyrrole entrapped acetylcholinesterase electrode, *Biosensors and Bioelectronics,*52:166–172.

370. Dhull, V., Gahlaut, A., Dilbaghi, N., Hooda, V. (2013). Acetylcholinesterase Biosensors for Electrochemical Detection of Organophosphorus Compounds: A Review, *Biochemistry Research International.*2013: 1-18.

371. Wei, M.,Wang, J., (2015). A novel acetylcholinesterase biosensor based on ionic liquids-AuNPs-porous carbon composite matrix for detection of organophosphate pesticides., Sensors and Actuators B, 211 : 290–296.
372. Y. Liu, M. Wei. (2014). Development of acetylcholinesterase biosensor based on platinum-carbon aerogels composite for determination of organophosphorus pesticides, Food Control, 36 : 49–54.
373. Kumar, S., Aaron, J., and Sokolov, K. (2008). Directional conjugation of antibodies to nanoparticles for synthesis of multiplexed optical contrast agents with both delivery and targeting moieties, *Nat. Protoc*, 3: 314–320.
374. Kaushik, A., Arya, S.K.,Vasudev, A., Bhansali, S.(2013). Nanocomposites based on chitosan - metal/metal oxides hybrids for biosensors applications, *J. Nanosci. Lett*., 3: 1–18.
375. Li, H., Guo, J., Ping, H., Liu, L., Zhang, M., Guan, F., Sun, C., Zhang, Q. Visual detection of organophosphorus pesticides represented by mathamidophos using Au nanoparticles as colorimetric.
376. Yang, Y., Mohamed Asiri, A., Du, D., and Lin, Y.(2014).Acetylcholinesterase biosensor based on a gold nanoparticle–polypyrrole–reduced graphene oxide nanocomposite modified electrode for the amperometric detection of organophosphorus pesticides, *Analyst*, 139-3055.
377. Yang, G., Zhou, Y., Pan, H.-B., Zhu, C., Fu, S., Wai, C.M., Du, D., Zhu, J.-J., Lin, Y. (2016). Ultrasonic-assisted synthesis of Pd–Pt/carbon nanotubes nanocomposites for enhanced electro-oxidation of ethanol and methanol in alkaline medium. *Ultrason. Sonochem,* 28:192–198.
378. Guo, S.J.,Wen, D., Zhai, Y.M., Dong,S.J., Wang, E.W.(2011). Ionic liquid-graphene hybrid nanosheets as an enhanced material for electrochemical determination of trinitrotoluene, *Biosens. Bioelectron*, 26:3475–3481.
379. Shenoy, D. B., & Sukhorukov, G. B. (2004). Engineered microcrystals for direct surface modification with layer-by-layer technique for optimized dissolution,*European Journal of Pharmaceutics and Biopharmaceutics,* 58:521–527.
380. Stephan, B., Ludovic, L., & Dominique, W. (2011). Modelling of a falling thin film deposited photocatalytic step reactor for water purification: Pesticide treatment. *Chemical Engineering Journal*, 169:216–225.

381. Groenendaal,B.L., Jonas, F., Freitag, D., Pielartzik, H., Reynolds, J.R.(2000). Poly(3,4-ethylenedioxythiophene) and its derivatives: past, present, and future, *Adv Mater,* 12:481-94.

382. Wang, W., Xu, G., Cui, X.T., Sheng, G., Luo, X.(2014). Enhanced catalytic and dopamine sensing properties of electrochemically reduced conducting polymer nanocomposite doped with pure graphene oxide. *Biosens. Bioelectron.* 58, 153–156

383. Luo, X., Weaver, C.L., Zhou, D.D., Greenberg, R., Cui, X.T.(2011). Highly stable carbon nanotube doped poly(3,4-ethylenedioxythiophene) for chronic neural stimulation, *Biomaterials* 32 (24): 5551–5557.

384. Tait, J.G., Worfolk, B.J., Maloney, S.A., Hauger, T.C., Elias, A.L., Buriak, J.M., Harris, K. D.(2013). Spray coated high-conductivity PEDOT:PSS transparent electrodes for stretchable and mechanically-robust organic solar cells, *Sol. Energy Mater. Sol. Cells* 110 (0): 98–106.

385. Luo , X., Cassandra, L., David, D., Greenberg, R.,Cui, X.T.(2011). Highly stable carbon nanotube doped poly(3,4-ethylenedioxythiophene) for chronic neural stimulation, *Biomaterials* 32: 5551-5557.

386. Cui XT, Zhou DD. Poly (3,4-ethylenedioxythiophene) for chronic neural stimulation. IEEE Trans Neural Syst Rehabil Eng 2007;15:502-8.

387. Dreyer, D.R., Park, S., Bielawski, C.W., Ruoff, R.S.(2010). The chemistry of graphene oxide, *Chem. Soc. Rev.,* 39 (1):228–240.

388. Tian, H.C., Liu, J.Q., Wei, D.X., Kang, X.Y., Zhang, C., Du, J.C., Yang, B., Chen, X. (2014).Graphene oxide doped conducting polymer nanocomposite film for electrode-tissue interface. *Biomaterials 35* (7):2120–2129.

389. Yajie, Y., Shibin, L., Wenyao, Y., Wentao, Y., Jianhua, X., Yadong, J.(2014). In Situ Polymerization Deposition of Porous Conducting Polymer on Reduced Graphene Oxide for Gas Sensor, *ACS Appl. Mater. Interfaces,* 6 (16):13807–13814.

390. Xiaoliang, Y., Yongling, D., Kaiyue, D., Daban, L., Chunming, W., Shi, X.(2014). Fabrication of nano-ZnS coated PEDOT-reduced graphene oxide hybrids modified glassy carbon-rotating disk electrode and its application for simultaneous determination of adenine, guanine, and thymine, *Sens. Actuators B Chem.,* 203:271–281.

391. Zhang, J., Zhang, F., Yang, H., Huang, X., Liu, H., Zhang, J., Guo, S.(2010). Graphene Oxide as a Matrix for Enzyme Immobilization, *Langmuir* 26:6083–6085.

392. Li, D., Muller, M. B., Gilje, S., Kaner, R. B., Wallance, G. G.(2008). Processable aqueous dispersions of graphene nanosheets,*Nature Nanotechnol*, 3:101–105.

393. Tung, V,C., Kim, J.,Cote, L.J., Huang, J.(2011). Sticky interconnect for solution-processed tandem solar cells, *J. Am. Chem. Soc.*, 133:9262–9265.

394. Jans, H., Huo, Q.(2012). Gold nanoparticle-enabled biological and chemical detection and analysis, Gold nanoparticle-enabled biological and chemical detection and analysis. *Chem. Soc. Rev.*, 41:2849-2866.

395. Dreaden, E.C., Alkilany, A.M., Huang, X., Murphy, C.J., El-Sayed, M.A. (2012). The golden age: gold nanoparticles for biomedicine, *Chem. Soc. Rev.,* 41:2740-2779.

396. Tang, D., Liu, B., Niessner, R., Li, P., Knopp, D. (2013). Target-induced displacement reaction accompanying cargo release from magnetic mesoporous silica nanocontainers for fluorescence immunoassay, *Anal. Chem.*, 85:10589-10596.

397. Yuan, Y., Lee, T.R. (2013). Contact Angle and Wetting Properties, *Surface Science Techniques* pp 3-34.51.

398. Han, M.G., Foulger, S.H. (2005). 1-Dimensional structures of poly(3,4-ethylenedioxythiophene) (PEDOT): a chemical route to tubes, rods, thimbles, and belts, *Chem. Commun,*3092–3094.

399. Xu, Y., Wang, Y., Liang, J., Huang, Y., Ma, Y., Wan, X., Chen, Y.(2009). A hybrid material of graphene and poly (3,4-ethyldioxythiophene) with high conductivity, flexibility, and transparency, *Nano Res.,* 2:343–348.

400. Han, Y.Q., Ding, B., Tong, H., Zhang, X.G. (2011). Capacitance Properties of Graphite Oxide/Poly(3,4-ethylenedioxythiophene) Composites. *J. Appl. Polym. Sci.,* 121:892-898.

401. Zhang, J., Zhao, X.S. (2012). Conducting polymers directly coated on reduced graphene oxide sheets as high-performance supercapacitor electrodes, *J. Phys. Chem. C,* 116:5420–5426.

402. Zhang, J.,Yang, H., Shen, G., Cheng, P., Guo, S. (2010). Reduction of graphene oxide vial-ascorbic acid, *Chem. Commun.,* 46:1112–1114.

403. Xu, Y., Wang, Y., Liang, J., Huang, Y., Ma, Y., Wan, X. (2009). A hybrid material of graphene and poly (3,4-ethyldioxythiophene) with high conductivity, flexibility, and transparency,*Nano Res.*,2:343-8.

404. Kvarnström, C., Neugebauer, H., Blomquist, S., Ahonen, H.J., Kankare, J., Ivaska, A. (1999). In situ spectroelectrochemical characterization of poly(3,4-ethylenedioxythiophene), *Electrochim Acta*,44:2739-50.

405. Wang, D., Hu, W., Xiong, Y., Xu, Y., Ming, C. (2015). Multifunctionalized reduced graphene oxide-doped polypyrrole/pyrrolepropylic acid nanocomposite impedimetric immunosensor to ultra-sensitively detect small molecular aflatoxin, *Biosensors and Bioelectronics*, 63:185–189.

406. Guan, H., Zhang, F., Yu, J., Chi, D. (2012). The novel acetylcholinesterase biosensors based on liposome bioreactors–chitosan nanocomposite film for detection of organophosphates pesticides, *Food Research International*, 49:15–21.

407. Xu, M., Luo, X., and Davis, J.J. (2013).The label free picomolar detection of insulin in blood serum. *Biosensor and Bioelectron.*,39:21.

408. Li, X.L., Zhong, Q.N., Zhang, X.L., Li, T.T., Huang, J.M. (2015). *Thin Solid Films* 584: 348-352.

409. D. Du, Wang, M.H., Cai, J., Qin, Y.H., and Zhang, A.D. (2010). One-step synthesis of multiwalled carbon nanotubes-gold nanocomposites for fabricating amperometric acetylcholinesterase biosensor, *Sens. Actuators, B,* 143:524-529.

410. Henglein, A.(1999). Radiolytic Preparation of Ultrafine Colloidal Gold Particles in Aqueous Solution: Optical Spectrum, Controlled Growth, and Some Chemical Reactions, *Langmuir*15(20):6738–6744.

411. Xiao, Y., Lin, J., Wu, J., Tai, S.,Yue. (2013). Dye-sensitized solar cells with high performance PANI/MWCNT counter electrodes electropolymerized by a pulse potentiostatic technique, *J. Power Sources*, 233-320.

412. Xiao, Y., Lin, S., Tai, S., Chou, G., Yue, J.W. (2012). Pulse electropolymerization of high performance PEDOT/MWCNT counter electrodes for Pt-free dye-sensitized solar cells, *J. Mater. Chem*, 22 :19919-19925.

413. Geng, P., Fu, Y.,Yang, M., Sun, Q., Liu, K., Zhang, X., Xu, Z., Zhang, W. (2014). Amplified electrochemical immunosensor for calmodulin detection

based on gold-silvergraphene hybrid nanomaterials and enhanced gold nanorods labels, *Electroanalysis* 26 : 2002–2009.

414. Chauhan, N., Pundir, CS. (2014). Amperometric determination of acetylcholine-A neurotransmitter, by chitosan/gold-coated ferric oxide nanoparticles modified gold electrode, *Biosens Bioelectron,*61:1-8.

415. Arjmand,M., Saghafifar, H., Alijanianzadeh, M., Soltanolkotabi, M. (2017). A sensitive tapered-fiber optic biosensor for the label-free detection of organophosphate pesticides., *Sensors and Actuators B: Chemical*, 249:523-532.

416. Du, D., Xiaoxue Y, Caib, J., Liua, J., Zhanga. Acetylcholinesterase biosensor design based on carbon nanotube-encapsulated polypyrrole and polyaniline copolymer for amperometric detection of organophosphates, *Biosensor & bioelectronics,* 25:2503-2508.

417. Cui., H.F.,Wu., W.W., Li., M.M., Song., X., Lv., Y.,Zhang., T.T. (2018). A highly stable acetylcholinesterase biosensor based on chitosan-TiO2-graphene nanocomposites for detection of organophosphate pesticides. *Biosensors and Bioelectronics.,*99: 223-229.

418. V.Martina, K., I H, Pigani, F. Terzi, A., Ulrici, C., Zanardi, R.S.(2007). Development of an electronic tongue based on a PEDOT modified voltammetric sensor, Anal. *Bioanal. Chem.* 387:2101–2110.

419. Kros, D., Hovell, S.W., N.A.J.M., Sommerdijk, R.J.M. Nolte, Poly(3,4-ethylenedioxythiophene)-based glucose biosensors, Adv. Mater. 13 (2001) 1555–1557.

420. Benoudjita, A., Baderb, M.M., Salim., W.W. (2018). Study of electropolymerized PEDOT:PSS transducers for application as electrochemical sensors in aqueous media, *Sensing and Bio-Sensing Research.,*17: 18-24.

421. Phongphut, A., Sriprachuabwong, C., Wisitsoraat, A., Tuantranont, A., Prichanont, S., Sritongkham., P. (2013). A disposable amperometric biosensor based on inkjet-printed Au/PEDOT-PSS nanocomposite for triglyceride determination*. Sensors Actuators B Chem.,*178:501-507

422. Poomrat., T. Nattaya, R., Rodthongkum, N., Chailapakul, O. (2016). Free radical scavenger screening of total antioxidant capacity in herb and beverage using graphene/PEDOT: PSS-modified electrochemical sensor. *Journal of Electroanalytical Chemistry*, 767:Pages 68-75.

423. Macdiarmid, A., Epstein, A. (1995). Secondary doping: A new concept in conducting polymers, *Macromolecular Symposia*, 98: 835-842 .

424. MingHuang, L., HouChen, C., ChinWen, T., & Gopalan. (2006). Effect of secondary dopants on electrochemical and spectroelectrochemical properties of polyaniline, *Electrochimica Acta Volume* 51(13):2756-2764.

425. Benhu, J., Mei, X., and Ouyang, J. (2008). Significant Conductivity Enhancement of Conductive Poly(3,4-ethylenedioxythiophene):Poly(styrenesulfonate) Films by Adding Anionic Surfactants into Polymer Solution, *Macromolecules*, *41* (16): 5971–5973.

426. Branzoi, V., and Pilan, L. (2010). Electrochemical fabrication and capacitance of composite films of carbon nanotubes and polyaniline, *Surface and Interface Analysis*, 42(6-7):1266–1270.

427. Frackowiak, E. (2007). Carbon materials for supercapacitor application, *Physical Chemistry Chemical Physics*, 9:1774–1785.

428. Zhou, Y., He, B., Zhou, W. (2004). Electrochemical capacitance of well-coated single-walled carbon nanotube with polyaniline composites, *Electrochimica Acta*, 49:257–262.

429. Chen, J., Hamon, M.A., Hu, H., Chen, Y., Rao, A.M., Eklund, P.C., Haddon, R.C.(1998). Solution properties of single-walled carbon nanotubes, *Science* 282:95–98.

430. Zhang, J., Zou, H., Qing, Q., Yang, Y., Li, Q., Liu, Z., Guo, X., Du, Z. (2003). Sidewall Functionalization of Single-Walled Carbon Nanotubes by Addition of Dichlorocarbene, *J. Phys. Chem. B* 107:3712–3718.

431. Njobuenwu D. O., Nna E. (2005). The Effect of Critical Wetting Agent Concentration on Drilling Fluids Performance, *J. Sci. & Tech. Research*, 4(1): 65-71.

432. Lamour, G., Journiac, N., Soues, S., Bonneau, S., Nassoy, P., Hamraoui, A. (2009). Influence of surface energy distribution on neuritogenesis. *Colloids Surf., B*, 72:208–218.

433. Han, D.X., Yang, G.F., Song, J.X., Niu, L., Ivaska, A. (2007). *J. Electroanal. Chem*. 602 : 24-28.

434. Kvarnstrom, C., Neugebauer, H., Ivaska, A., Sariciftci, N. S. (2000). Vibrational signatures of electrochemical p- and n-doping of poly (3,4-

ethylenedioxythiophene) films: An in situ attenuated total reflection Fourier transform infrared (ATR-FTIR) study. *J. Mol. Struct*., 521: 271- 277.

435. Han, M. G., Foulger, S. H. (2005). 1-Dimensional structures of poly (3,4-ethylenedioxythiophene) (PEDOT) : A chemical route to tubes, rods, thimbles, and belts. *Chem. Commun.* 0:3092- 3094.
436. Deetuam, C., Samthong, C., Thongyai, S., Praserthdam, P., Somwangthanaroj, A. (2014). Synthesis of well dispersed graphene in conjugated poly(3,4ethylenedioxythiophene):polystyrene sulfonate via click chemistry. *Compos Sci Technol*,93:1–8.
437. Zhu, Z., Song, H., Xu, J., Liu, C., Jiang, Q., Shi, H. (2015). Significant conductivity enhancement of PEDOT:PSS films treated with lithium salt solutions. *J Mater Sci: Mater Electron*, 26:429–434.
438. Bhandari, S., Deepa, M., Srivastava, A.K., Joshi, A.G., Kant, R. (2009). Poly(3,4-ethylenedioxythiophene)-multiwalled carbon nanotube composite films: structure-directed amplified electrochromic response and improved redox activity. *J. Phys. Chem. B* 113:9416–9428.
439. Xiao, Y., Lin, J., Wu, J., Tai, S., Yue, G. (2013). Dye-sensitized solar cells with high performance PANI/MWCNT counter electrodes electropolymerized by a pulse potentiostatic technique. *J. Power Sources* 233-320
440. Singh,J.,Roychoudhury,A.,Srivastava,M.,Solanki,P.R.,Lee,D.W.,Lee,S.H.,Malhotra,B.D.(2013).*J.Mater.Chem.B1*(35):4493–4503.
441. Saleem, M., Rafiq, M., Seo, S., and Lee, K.H. (2016). Acetylcholinesterase immobilization and characterization, and comparison of the activity of the porous silicon-immobilized enzyme with its free counterpart. *Biosci Rep.* 36(2):1-10.
442. Du, D., Huang, X., Cai, J., Zhang, A., Ding, J., Chen, S. (2007). An amperometric acetylthiocholine sensor based on immobilization of acetylcholinesterase on a multiwall carbon nanotube–cross-linked chitosan composite. *Anal Bioanal Chem* ,387:1059–1065.
443. Fujiwara, A., Matsuoka, Y., Suematsu, H., Ogawa, N., Miyano, K., Kataura, H., Maniwa, Y., Suzuki, S., Achiba, Y. (2004). Photoconductivity of single-wall carbon nanotube films. *Carbon* 42 :919.

444. Rossmeisl, J., Karlberg , G.S., Jaramillo, T., and Nørskov, J.K. (2009). Steady state oxygen reduction and cyclic voltammetry. *Faraday Discuss.* 140:337-346.

445. Tang, D.Y., and Xia, B.Y. (2008). Electrochemical immune bioassay for the antigen–antibody interaction based on [Fe(CN)6] 4-/3- and [AuCl4] - ions-derivated biomimetic interface. *Ionics*, 14:329–334.,

446. Silva, O.B., and Machado, S. (2012). Evaluation of the detection and quantification limits in electroanalysis using two popular methods: application in the case study of paraquat determination. *Anal. Methods*,4: 2348-2354.

447. Chauhan, N., Chawla, S., Pundir, C.S., Jain, U. (2017). An electrochemical sensor for detection of neurotransmitter acetylcholine using metal nanoparticles, 2D material and conducting polymer modified electrode. *Biosensors and Bioelectronics* 89:377–383.

448. Viswanathan, S., Radecka, H., Radecki, J. (2009). Electrochemical biosensor for pesticides based on acetylcholinesterase immobilized on polyaniline deposited on vertically assembled carbon nanotubes wrapped with ssDNA. *Biosensors and Bioelectronics* 24:2772–2777.