

Bibliography

- [1] Abdolkader, T. M. A numerical simulation tool for nanoscale ion-sensitive field-effect transistor, *International Journal of Numerical Modelling: Electronic Networks, Devices and Fields*, 29(6):1118–1128, 2016.
- [2] Ahmad, R., Tripathy, N., and Hahn, Y. B. High-performance cholesterol sensor based on the solution-gated field effect transistor fabricated with ZnO nanorods. *Biosensors Bioelectronics*, 45:281–286, 2013.
- [3] Ali, M. A., Solanki, P. R., Patel, M. K., Dhayani, H., Agrawal, V. V., John, R., and Malhotra, B. D. A highly efficient microfluidic nano biochip based on nanostructured nickel oxide. *Nanoscale*, 5(7):2883–2891, 2013.
- [4] Allen, B.L., Kichambare, P.D., and Star, A. Carbon nanotube field- effect- transistor- based biosensors. *Advanced Materials*, 19(11), 1439-1451, 2007.
- [5] Aouni, F., Mlika, R., Martelet, C., Ben Ouada, H., Jaffrezic-Renault, N., and Soldatkin, A. P. Modelling of the Potentiometric Response of ENFETs Based on Enzymatic Multilayer Membranes. *Electroanalysis*, 16(22):1907-1911, 2004.
- [6] Barik, M. A. and Dutta, J. C. Fabrication and characterization of junctionless carbon nanotube field effect transistor for cholesterol detection. *Applied Physics Letters*, 105:053509-5, 2014.
- [7] Barik, M. A., Deka, R., and Dutta, J. C. Carbon Nanotube-Based Dual-Gated Junctionless Field-Effect Transistor for Acetylcholine Detection. *IEEE Sensors Journal* 16(2):280-286, 2016
- [8] Barik, M. A., Sarma, M. K., Sarkar, C. R. and Dutta, J. C. Highly sensitive potassium-doped polypyrrole/carbon nanotube-based enzyme field effect transistor (ENFET) for cholesterol detection. *Applied Biochemistry Biotechnology*, 174 (3):1104–1114, 2014.
- [9] Barik, M. A., Solanki, P. R., Kaushik, A., Ali, A., Pandey, M. K., Kim, C. G., and Malhotra, B. D. Polyaniline–carboxymethyl cellulose nanocomposite for cholesterol detection. *Journal of Nanoscience and Nanotechnology*, 10(10):6479–6488, 2010.
- [10] Baynes, J. W. and Dominiczak, M. H. *Medical Biochemistry E-Book*. Elsevier Health Sciences, 4th Edition, 2014.

- [11] Bergveld, P. Development of an ion-sensitive solid-state device for neurophysiological measurements. *IEEE Transactions on Biomedical Engineering*, 17(1):70–71, 1970.
- [12] Bergveld, P. Thirty years of ISFETOLOGY, what happened in the past 30 years and what may happen in the next 30 years. *Sensors and Actuators B*, 88:1–20, 2003.
- [13] Biswas, C. and Lee, Y. H. Graphene Versus Carbon Nanotubes in Electronic Devices. *Wiley Advanced Functional Materials*, 21:3806–3826, 2011.
- [14] Bousse, L., De Rooij, N. F., and Bergveld, P. Operating of chemically sensitive field effect sensors as a function of the insulator electrolyte interface. *IEEE Transactions on Electron Devices ED*, 30:1263-1270, 1983.
- [15] Boyer, P.T., Benyahia, A., Sant, W., Pourciel-Gouzy, M. L., Launay, J., and Martinez, A. Modelling of urea-EnFETs for haemodialysis applications. *Sensors and Actuators B*, 131:525–532, 2008.
- [16] Boyer, P.T., Le Gal, J., Pourciel-Gouzy, M. L., Sant, W., and Martinez, A. Modelling of EnFETs for the creatinine detection. *Sensors and Actuators B*, 118:47–52, 2006.
- [17] Caras, S. and Janata, J. Field effect transistor sensitive to penicillin. *Analytical Chemistry*, 52:1935–1937, 1980.
- [18] Chin, S. K., Seath, D., and Lam, K. T. Device physics and characteristics of graphene nanoribbon tunneling FETs. *IEEE Transaction on Electron Devices*, 57:3144–3152, 2010.
- [19] Chou, J. C. and Liao, L. P. Study on pH at the point of zero charge of TiO₂ pH ion-sensitive field effect transistor made by the sputtering method. *Thin Solid Films*, 476(1):157-161, 2005.
- [20] Colinge, J.P., Lee, C.W., Afzalian, A., Akhavan, N.D., Yan, R., Ferain, I., Razavi, P., O'neill, B., Blake, A., White, M., and Kelleher, A. M. Nanowire transistors without junctions. *Nature Nanotechnology*, 5(3):225–229, 2010.
- [21] Daniel, M., Janicki, M., and Napieralski, A. Simulation of Ion Sensitive Transistors Using a SPICE Compatible Model. In *IEEE International Conference on Sensors (SENSORS-2003)*, pages 543 – 548, Baltimore, Maryland, USA, 2003.

- [22] Davis, J. A., James, R. O., and Leckie, J. O. Surface ionization and complexation at the oxide/water interface. *Journal of Colloid and Interface Science*, 63:480-499, 1978.
- [23] Dennard, R. H., Gaenslen, F. H., Rideout, V. L., Bassous, E., and LeBlanc, A. R. Design of ion-implanted MOSFET's with very small physical dimensions. *IEEE Journal of Solid-State Circuits*, 9(5):256-268, 1974.
- [24] Doerk, G. S., Lestari, G., Liu, F., Carraro, C., and Maboudian, R. Ex situ vapor phase boron doping of silicon nanowires using BBr_3 . *Nanoscale*, 2(7):1165-1170, 2010.
- [25] Doria, R.T., Pavanello, M.A., Trevisoli, R.D., de Souza, M., Lee, C.W., Ferain, I., Akhavan, N.D., Yan, R., Razavi, P., Yu, R., and Kranti, A. Junctionless multiple-gate transistors for analog applications. *IEEE transactions on electron devices*, 58(8):2511-2519, 2011.
- [26] Du, C. and Pan, N. High power density supercapacitor electrodes of carbon nanotube films by electrophoretic deposition. *Nanotechnology*, 17(21):5314-5318, 2006.
- [27] Dutta, J. C. Ion sensitive field effect transistor for applications in bioelectronic sensors: A research review. In *IEEE 2nd National Conference Computational Intelligence and Signal Processing* (CISP-2012), pages 185–191, Guwahati, Assam, India, 2012.
- [28] Enderle, J. D. and Bronzino, J. D. *Introduction to biomedical engineering*. Academic Press Series, Elsevier, Trinity College—Hartford, Connecticut, 3rd Edition, 2012.
- [29] Fatona, A., Chen, Y., Reid, M., Brook, M.A., and Moran-Mirabal, J.M. One-step in-mould modification of PDMS surfaces and its application in the fabrication of self-driven microfluidic channels. *Lab on a Chip*, 15(22):4322-4330, 2015.
- [30] Fick, A. Ueber diffusion. *Annalen der Physik*, 170(1):59-86, 1855.
- [31] Fung, C. D., Cheung, P. W., and Ko, W. H. A generalized theory of an electrolyte-insulator-semiconductor field-effect transistor. *IEEE Transactions on Electron Devices*, 33(1):8-18, 1986.
- [32] Gerard, M. A., Chaubey, A., and Malhotra, B. D. Application of conducting polymers to biosensors. *Biosensors and Bioelectronics*, 17(5):345–359, 2002.

- [33] Go, J., Nair, P. R., Reddy, B., Dorvel, B., Bashir, R., and Alam, M. A. Beating the Nernst limit of 59mV/pH with Double-Gated Nano-Scale Field-Effect Transistors and Its Applications to Ultra-Sensitive DNA Biosensors. In *IEEE International Electron Devices Meeting* (IEDM-2010), pages 871-874, San Francisco, CA, USA, 2010.
- [34] Grattarola, M. and Massobrio, G. *Bioelectronics Handbook: MOSFETs, Biosensors, and Neurons*. McGraw-Hill, New York, USA, 1998.
- [35] Grattarola, M., Massobrio, G., and Martinoia, S. Modelling H⁺ Sensitive FET's with SPICE. *IEEE Transactions on Electron Devices*, 39(4):813-818, 1992.
- [36] Graves, L., Pack, A., and Abel, T. Sleep and memory: A molecular perspective. *Trends in Neurosciences*, 24(4):237–243, 2001.
- [37] Gubala, V., Harris, L. F., Ricco, A. J., Tan, M. X., and Williams, D. E. Point of care diagnostics: status and future. *Analytical chemistry*, 84(2):487-515, 2011.
- [38] Guo, B., Fang, L., Zhang, B., and Gong, J. R. Graphene doping: a review. *Insciences Journal*, 1(2):80-89, 2011.
- [39] Han, M. Y., Ozyilmaz, B., Zhang, Y., and Kim, P. Energy band-gap engineering of graphene nanoribbons. *Physical review letters*, 98(20), 206805-1-4, 2007.
- [40] Hasselmo, M. E., and Bower, J. M. Acetylcholine and memory. *Trends in Neurosciences*, 16(6):218–222, 1993.
- [41] *HSPICE User's Manual*, Meta-Software, Campbell, CA, USA, 1992.
- [42] Hulanicki, A. and Masson, M. R. *Reactions of acids and bases in analytical chemistry*. Halsted Press, New York, USA, 1987.
- [43] Ishige, Y., Shimoda, M., and Kamahari, M. Extended-gate FET-based enzyme sensor with ferrocenylalkanethiol modified gold sensing electrode. *Biosensors and Bioelectronics*, 24:1096–1102, 2009.
- [44] Janata, J., and Moss, S. D. Chemically sensitive field effect transistors. *Biomedical Engineering*, 11(7):241–245, 1976.
- [45] Janicki M., Daniel, M., and Napieralski, A. Modelling of Temperature Phenomena in Ion Sensitive Transistors. In *Ninth International Workshop on Thermal Investigations of ICs and Systems* (THERMINIC-2003), pages 335-340, Aix-en-Provence, France, 2003.

- [46] Janicki M., Daniel, M., Szermer, M., and Napieralski, A. Ion sensitive field effect transistor modelling for multidomain simulation purposes. *Microelectronics Journal*, 35: 831–840, 2004.
- [47] Javey, A., Guo, J., Farmer, D.B., Wang, Q., Wang, D., Gordon, R.G., Lundstrom, M., and Dai, H. Carbon nanotube field-effect transistors with integrated ohmic contacts and high- κ gate dielectrics. *Nano Letters*, 4(3):447-450, 2004.
- [48] Javey, A., Guo, J., Farmer, D.B., Wang, Q., Yenilmez, E., Gordon, R. G., Lundstrom, M., and Dai, H. Self-aligned ballistic molecular transistors and electrically parallel nanotube arrays. *Nano letters*, 4(7):1319-1322, 2004.
- [49] Javey, A., Kim, H., Brink, M., Wang, Q., Ural, A., Guo, J., McIntyre, P., McEuen, P., Lundstrom, M., and Dai, H. High- κ dielectrics for advanced carbon-nanotube transistors and logic gates. *Nature Materials*, 1:241–246, 2002.
- [50] Javey, A., Tu, R., Farmer, D.B., Guo, J., Gordon, R.G., and Dai, H. High performance n-type carbon nanotube field-effect transistors with chemically doped contacts. *Nano letters*, 5(2):345-348, 2005.
- [51] Karajanagi, S. S., Vertegel, A. A., Kane, R. S., and Dordick, J. S. Structure and function of enzymes adsorbed onto single-walled carbon nanotubes. *Langmuir*, 20(26):11594-11599, 2004.
- [52] Kazmierski, T. J., Zhou, D., Al-Hashimi, B. M., and Ashburn, P. Numerically efficient modeling of CNT transistors with ballistic and nonballistic effects for circuit simulation. *IEEE Transactions on Nanotechnology*, 9(1):99-107, 2010.
- [53] Kazmierski, T. J., Zhou, D., and Al-Hashimi, B.M. HSPICE implementation of a numerically efficient model of CNT transistor. In *IEEE Forum on Specification & Design Languages* (FDL-2009), pages 1-5, Sophia Antipolis, France, 2009.
- [54] Khanna, V. K. *Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies, NanoScience and Technology*. Springer India, 2016.
- [55] Khanna, V.K. Fabrication of ISFET microsensor by diffusion-based Al gate NMOS process and determination of its pH sensitivity from transfer characteristics. *Indian Journal of Pure & Applied Physics*, 50:199-207, 2012.

- [56] Kharitonov, A. B., Zayats, M., Lichtenstein, A., Katz, E., and Willner, I. Enzyme monolayer-functionalized field-effect transistors for biosensor applications. *Sensors and Actuators B: Chemical*, 70(1–3):222– 231, 2000.
- [57] Kiani, M.J., Ahmadi, M. T., Abadi, H. K. F., Rahmani, M., Hashim, A., and Harun, F. K. C. Analytical modelling of monolayer graphene-based ion-sensitive FET to pH changes. *Nanoscale Research Letters*, 8:173-1-9, 2013.
- [58] Knopfmacher, O., Tarasov, A., Fu, W., Wipf, M., Niesen, B., Calame, M., and Schonberger, C. Nernst Limit in Dual-Gated Si-Nanowire FET Sensors. *Nano Letters*, 10:2268–2274, 2010.
- [59] Kreit, J. and Sampson, N. S. Cholesterol oxidase: physiological functions. *The FEBS journal*, 276(23):6844-6856, 2009.
- [60] Kumar, M. and Ando, Y. Chemical vapor deposition of carbon nanotubes: a review on growth mechanism and mass production. *Journal of nanoscience and nanotechnology*, 10(6):3739-3758, 2010.
- [61] Li, E. Y. and Marzari, N. Improving the electrical conductivity of carbon nanotube networks: A first-principles study. *ACS Nano*, 5(12):9726-9736, 2011.
- [62] Liu, Z., Kobayashi, M., Paul, B. C., Bao, Z., and Nishi, Y. Fermi level depinning at metal-organic semiconductor interface for low-resistance Ohmic contacts. In *IEEE International Electron Devices Meeting (IEDM-2009)*, pages 1-4, Baltimore, MD, USA, 2009.
- [63] Luppa, P. B., Muller, C., Schlichtiger, A., and Schlebusch, H. Point-of-care testing (POCT): Current techniques and future perspectives. *Trends in Analytical Chemistry*, 30(6):887-898, 2011.
- [64] Ma, Y., Wen, C., Zeng, R., Xu, M., Pan, J., and Wu, D. Compact modelling and simulation of extended-gate ion-sensitive field-effect-transistor. In *IEEE 12th International Conference on Solid-State and Integrated Circuit Technology (ICSICT-2014)*, pages 1-3, Guilin, CKiani hina, 2014.
- [65] Maity, N. P., Maity, R., Thapa, R. K., and Baishya, S. Study of Interface Charge Densities for ZrO_2 and HfO_2 based Metal-Oxide-Semiconductor Devices. *Advances in Materials Science and Engineering*, 2014:1-6, 2014.
- [66] Malik, N. R. *Electronic circuits : analysis, simulation, and design*. Prentice Hall, Upper Saddle River, NJ, USA, 1995.

- [67] Martinoia, S., and Massobrio, G. Behavioral macromodel of the ISFET in SPICE. *Sensors Actuators B Chemical*, 62(3):182–189, 2000.
- [68] Martinoia, S., Lorenzelli, L., Massobrio, G., Margesin, B., and Lui, A. A CAD system for developing chemical sensor-based microsystems with an ISFET-CMOS compatible technology. *Sensors and Materials*, 11(5):32–49, 1999.
- [69] Martinoia, S., Massobrio, G., and Grattarola, M. An ISFET model for CAD applications, *Sensors and Actuators B*, 8:261-265, 1992.
- [70] Martinoia, S., Rosso, N., Grattarola, M., Lorenzelli, L., Margesin, B., and Zen, M. Development of ISFET array-based microsystems for bioelectrochemical measurements of cell populations. *Biosensors and Bioelectronics*, 16:1043–1050, 2001.
- [71] Massobrio, G., Martinoia, S., and Grattarola, M. Ion Sensitive Field Effect Transistor (ISFET) model implemented in SPICE. *Simulation of Semiconductor Devices and Processes*, 4:563-570, 1991.
- [72] McCafferty, E. Relationship between the isoelectric point (pH_{pzc}) and the potential of zero charge ($Epzc$) for passive metals. *Electrochimica Acta*, 55(5):1630-1637, 2010.
- [73] Meixner, L. K. and Koch, S. Simulation of ISFET operation based on the site-binding model. *Sensors and Actuators B*, 6:315-318, 1992.
- [74] Miyahara, Y., Matsu, F., Moriizumi, T., Matsuoka, H., Karube, I., and Suzuki, S. Micro enzyme sensor using semiconductor and enzyme-immobilization techniques. *Analytical Chemistry Symposia Series*, 17, Elsevier, London, 1983.
- [75] Muhammad, S., Hussain, S. T., Waseem, M., Naeem, A., Hussain, J., and Jan, M. T. Surface charge properties of zirconium dioxide. *Iranian Journal of Science and Technology*, 36(4):481–486, 2012.
- [76] Munoz, J., Jimenez, C., Bratov, A., Bartoli, J., Alegret, G., and Dominguez, C. Photosensitive polyurethanes applied to the development of CHEMFET and ENFET devices for biomedical sensing. *Biosensors and Bioelectronics*, 12(7):577–585, 1997.
- [77] Oh, J.Y., Jang, H. J., Cho, W. J., and Islam, M. S. Highly sensitive electrolyte-insulator-semiconductor pH sensors enabled by silicon nanowires with Al_2O_3/SiO_2 sensing membrane. *Sensors and Actuators B*, 171– 172:238– 243, 2012.

- [78] Ortiz-Conde, A., Sanchez, F. G., Liou, J. J., Cerdeira, A., Estrada, M., and Yue, Y. A review of recent MOSFET threshold voltage extraction methods. *Microelectronics Reliability*, 42(4-5):583-596, 2002.
- [79] Pal, A. MOS Fabrication Technology. In *Low-Power VLSI Circuits and Systems*, pages 19-42, Springer, New Delhi, 2015.
- [80] Perry, E., Walker, M., Grace, J., and Perry, R. Acetylcholine in mind: A neurotransmitter correlates of consciousness? *Trends in Neurosciences*, 22(1):273–280, 1999.
- [81] Pourasl, A.H., Ahmadi, M. T., Rahmani, M., Chin, H. C., Lim, C. S., Ismail, R., and Tan, M. L. P. Analytical modeling of glucose biosensors based on carbon nanotubes. *Nanoscale Research Letters*, 9:33-1-7, 2014.
- [82] Prado, J. M. M. *Current transport modeling of carbon nanotube field effect transistors for analysis and design of integrated circuits*. PhD thesis, Department of Electrical and Computer Engineering, Louisiana State University, Baton Rouge, U.S.A, 2008.
- [83] Raaijmakers, J. G. W. Statistical Analysis of the Michaelis-Menten Equation. *Biometrics*, 43(4): 793-803, 1987.
- [84] Sahoo, R. and Mishra, R. R. Simulations of carbon nanotube field effect transistors. *International Journal of Electronic Engineering Research*, 1(2):117–125, 2009.
- [85] Sakuma, H. and Ishii, K. Gas flow sputtering: Versatile process for the growth of nanopillars, nanoparticles, and epitaxial thin films. *Journal of Magnetism and Magnetic Materials*, 321(7):872-875, 2009.
- [86] Schoning, M. J. and Poghossian, A. Recent advances in biologically sensitive field-effect transistors (BioFETs). *Analyst*, 127:1137–1151, 2002.
- [87] Sergio, M. and Massobrio, G. A behavioral macromodel of the ISFET in SPICE. *Sensors and Actuators B*, 62:182–189, 2000.
- [88] Sharma, A. L., Singhal, R., Kumar, A., Rajrsh, Pande, K. K., and Malhotra, B. D. Immobilization of glucose oxidase onto electrochemically prepared poly (aniline-*co*-fluoroaniline) films. *Journal of Applied Polymer Science*, 91(6):3999–4006, 2004.
- [89] Sharma, S. K., Suman, Pundir, C. S., Sehgal, N., and Kumar, A. Galactose sensor based on galactose oxidase immobilized in polyvinyl formal. *Sensors and Actuators B: Chemical*, 119(1):15–19, 2006.

- [90] Shim, M., Javey, A., Shi Kam, N.W., and Dai, H. Polymer functionalization for air-stable n-type carbon nanotube field-effect transistors. *Journal of the American Chemical Society*, 123(46):11512-11513, 2001.
- [91] Singh, J., Kalita. P., Singh, M. K., and Malhotra, B. D. Nanostructured nickel oxide-chitosan film for application to cholesterol sensor. *Applied Physics Letters*, 98(12):123702-1–123702-2, 2011.
- [92] Singh, S., Solanki, P. R., Pandey, M. K., and Malhotra, B. D. Cholesterol biosensor based on cholesterol esterase, cholesterol oxidase and peroxidase immobilized onto conducting polyaniline films. *Sensors and Actuators B: Chemical*, 115(1):534–541, 2006.
- [93] Skong, D. A. *Fundamentals of analytical chemistry*. Student collection, Philadelphia, 2014.
- [94] Spijkman, B. M., Brondijk, J. J., Geuns, T. C. T., Smits, E. C. P., Cramer, T., Zerbetto, F., Stoliar, P., Biscarini, F., Blom, P. W. M., and Leeuw, D. M. Dual-Gate Organic Field-Effect Transistors as Potentiometric Sensors in Aqueous Solution. *Wiley Advanced Functional Materials*, 20:898–905, 2010.
- [95] Spijkman, M., Smits, E. C. P., Cillessen, J. F. M., Biscarini, F., Blom, P. W. M., and Leeuw, D. M. Beyond the Nernst-limit with dual-gate ZnO ion-sensitive field-effect transistors. *Applied Physics Letters*, 98(4):043502-1–043502-3, 2011.
- [96] Sundaram, P. V., Tweedale, A., and Laidler, K. J. Kinetic laws for solid-supported enzymes. *Canadian Journal of Chemistry*, 48(10): 1498-1504, 1970
- [97] Suzuki, K. and Kato, K. Crystallization behavior of HfO₂ films for (Y,Yb) MnO₃/HfO₂/Si Structures. *Integrated Ferroelectrics*, 94(1):3–10, 2007.
- [98] Suzuki, K. and Kato, K. Sol-gel synthesis of High- κ HfO₂ thin films. *Journal of the American Ceramic Society*, 92 ([S1]): S1162– S164, 2009.
- [99] Trevan, M. D. Enzyme immobilization by covalent bonding. *Methods in Molecular Biology*, 3: 495–510, 1988.
- [100] van Hal, R.E.G., Eijkel, J.C.T., and Bergveld, P. A general model to describe the electrostatic at electrolyte oxide interfaces. *Advances in Colloid and Interface Science*, 69:31-62, 1996.
- [101] van Hal, R.E.G., Eijkel, J.C.T., and Bergveld, P. A novel description of ISFET sensitivity with the buffer capacity and double-layer capacitance as key parameters. *Sensors and Actuators B*, 24-25:201-205, 1995.

- [102] Warsinke, A. Point-of-care testing of proteins. *Analytical and Bioanalytical Chemistry*, 393:1393–405, 2009.
- [103] White, A., Handler, P., Smith, E. L., Hill, R. L., and Lehman, I. R. *Principles of biochemistry*. McGraw-Hill Book, New York, 6th Edition, 1987.
- [104] Yates, D. E., Levine, S., and Healy, T. W. Site-binding Model of the Electrical Double Layer at the Oxide/Water Interface. *Journal of the Chemical Society Faraday Transactions 1*, 70:1807-1818, 1974.
- [105] Zhang, B., Dong, Q., Korman, C.E., Li, Z., and Zaghloul, M.E. Flexible packaging of solid-state integrated circuit chips with elastomeric microfluidics. *Scientific reports*, 3:113-128, 2013.
- [106] Zhao, Y., Liao, A., and Pop, E. Multiband mobility in semiconducting carbon nanotubes. *IEEE electron device letters*, 30(10):1078-1080, 2009.
- [107] Zhaoxia, S. and Dazhong, Z. Modeling and discussion of threshold voltage for a multi-floating gate FET pH sensor. *Journal of Semiconductors*, 30(11):114011-1– 4, 2009.