

References

- [1] “Graphic: Transistor Production Has Reached Astronomical Scales - IEEE Spectrum.” [Online]. Available: <https://spectrum.ieee.org/computing/hardware/transistor-production-has-reached-astronomical-scales>. [Accessed: 05-Apr-2021].
- [2] Y. Kuo, “Thin film transistor technology-Past, present, and future,” *Electrochem. Soc. Interface*, vol. 22, no. 1, 2013.
- [3] Y. Yamamoto, “Technological Innovation of Thin-Film Transistors: Technology Development, History, and Future,” *Jpn. J. Appl. Phys.*, vol. 51, p. 060001, May 2012.
- [4] N. Hall, “Twenty-five years of conducting polymers,” *Chemical Communications*, no. 1. Royal Society of Chemistry, pp. 1–4, 01-Jan-2003.
- [5] “Organic Electronics Market Size, Share, Trends, Opportunities & Forecast.” [Online]. Available: <https://www.verifiedmarketresearch.com/product/organic-electronics-market/>. [Accessed: 05-Apr-2021].
- [6] E. Cantatore *et al.*, “A 13.56-MHz RFID system based on organic transponders,” *IEEE J. Solid-State Circuits*, vol. 42, no. 1, pp. 84–92, 2007.
- [7] A. Bonfiglio *et al.*, “Organic field effect transistors for textile applications.,” *IEEE Trans. Inf. Technol. Biomed.*, vol. 9, no. 3, pp. 319–324, 2005.
- [8] A. N. Sokolov, B. C.-K. Tee, C. J. Bettinger, J. B.-H. Tok, and Z. Bao, “Chemical and Engineering Approaches to Enable Organic Field-Effect Transistor for Electronic Skin Applications,” *Acc. Chem. Res.*, vol. 45, no. 3, pp. 361–371, 2012.
- [9] C. Shim, F. Maruoka, and R. Hattori, “Structural Analysis on Organic Thin-Film Transistor With Device Simulation,” *IEEE Trans. Electron Devices*, vol. 57, no. 1, pp. 195–200, 2010.
- [10] C. Yang *et al.*, “Pentacene-Based Planar- and Vertical-Type,” *IEEE Trans. Electron Devices*, vol. 54, no. 7, pp. 1633–1636, 2007.
- [11] P. Y. Lo, P. W. Li, Z. W. Pei, J. Hou, and Y. J. Chan, “Enhanced P3HT OTFT transport performance using double gate modulation scheme,” *IEEE Electron Device Lett.*, vol. 30, no. 6, pp. 629–631, 2009.
- [12] W. Chenglong, Y. Jianhong, C. Xueyuan, and S. Xiaofeng, “Threshold voltage adjustment of organic thin film transistor by introducing a polysilicon floating gate,” *J. Semicond.*, vol. 31, no. 3, pp. 0340041–3, 2010.
- [13] “Interview with the CEO of OTFT developer SmartKem | OLED-Info.” [Online]. Available: <https://www.oled-info.com/interview-ceo-otft-developer-smartkem>. [Accessed: 26-Apr-2021].
- [14] “OTFT | CLAP.” [Online]. Available: <http://clapeng.iwinv.net/wp/otft/>. [Accessed: 26-Apr-2021].
- [15] T. C. Huang, J. L. Huang, and K. T. T. Cheng, “Robust circuit design for flexible electronics,” *IEEE Des. Test Comput.*, vol. 28, no. 6, pp. 8–15, Nov. 2011.
- [16] P. Mittal, Y. S. Negi, and R. K. Singh, “Impact of source and drain contact thickness on the performance of organic thin film transistors,” *J. Semicond.*, vol. 35, no. 12, p. 124002, Dec. 2014.
- [17] T. Zaki *et al.*, “AC characterization of organic thin-film transistors with asymmetric gate-to-source and gate-to-drain overlaps,” *Org. Electron.*, vol. 14, no. 5, pp. 1318–1322, May 2013.

- [18] J. Park, L. M. Do, C. Pearson, M. Petty, D. W. Kim, and J. S. Choi, “An experimental study of the effects of source/drain to gate overlap in pentacene thin-film transistors,” in *Japanese Journal of Applied Physics*, 2012, vol. 51, no. 9 PART3, p. 09MJ01.
- [19] S. Xu *et al.*, “Effects of source/drain electrode contact length on the photoresponsive properties of organic field-effect transistors,” *Opt. Mater. Express*, vol. 8, no. 4, p. 901, Apr. 2018.
- [20] D. J. Gundlach, L. Zhou, J. A. Nichols, T. N. Jackson, P. V. Necliudov, and M. S. Shur, “An experimental study of contact effects in organic thin film transistors,” *J. Appl. Phys.*, vol. 100, no. 2, pp. 0245091–13, 2006.
- [21] C. Lu *et al.*, “Progress in flexible organic thin-film transistors and integrated circuits,” *Sci. Bull.*, vol. 61, no. 14, pp. 1081–1096, Jul. 2016.
- [22] D. Gupta, “Organic Electronics II,” in *REACH Symposium*, 2007, pp. 111–117.
- [23] M. C. J. M. Vissenberg and M. Matters, “Theory of the field-effect mobility in amorphous organic transistors,” *Phys. Rev. B*, vol. 57, no. 20, pp. 12964–67, 1998.
- [24] S. D. Baranovskii, H. Cordes, F. Hensel, and G. Leising, “Charge-carrier transport in disordered organic solids,” *Phys. Rev. B*, vol. 62, no. 12, pp. 7934–7938, 2000.
- [25] V. Podzorov, E. Menard, A. Borissov, V. Kiryukhin, J. A. Rogers, and M. E. Gershenson, “Intrinsic charge transport on the surface of organic semiconductors,” *Phys. Rev. Lett.*, vol. 93, no. 8, pp. 1–4, 2004.
- [26] D. Yu, C. Wang, B. L. Wehrenberg, and P. Guyot-Sionnest, “Variable range hopping conduction in semiconductor nanocrystal solids,” *Phys. Rev. Lett.*, vol. 92, no. 21, pp. 2168021–4, 2004.
- [27] V. Coropceanu, J. Cornil, D. a. da Silva Filho, Y. Olivier, R. Silbey, and J.-L. Brédas, “Charge transport in organic semiconductors,” *Chem. Rev.*, vol. 107, pp. 926–952, 2007.
- [28] A. Salleo, “Charge transport in polymeric transistors,” *Mater. Today*, vol. 10, no. 3, pp. 38–45, 2007.
- [29] F. Torricelli, “Charge Transport in Organic Transistors Accounting for a Wide Distribution of Carrier Energies-Part I: Theory,” *IEEE Trans. Electron Devices*, vol. 59, no. 5, pp. 1514–1519, 2012.
- [30] J. L. Brédas, J. P. Calbert, D. a da Silva Filho, and J. Cornil, “Organic semiconductors: a theoretical characterization of the basic parameters governing charge transport.,” in *Proceedings of the National Academy of Sciences of the United States of America*, 2002, vol. 99, no. 9, pp. 5804–5809.
- [31] H. Klauk, “Organic thin-film transistors,” *Chem. Soc. Rev.*, vol. 39, no. 7, pp. 2643–66, 2010.
- [32] J Noolandi, “Multiple-trapping model of anomalous transit-time dispersion in a-Se,” *Phys. Rev.*, vol. 16, no. 10, pp. 4466–4473, 1977.
- [33] W. L. Kalb, S. Haas, C. Krellner, T. Mathis, and B. Batlogg, “Trap density of states in small-molecule organic semiconductors: A quantitative comparison of thin-film transistors with single crystals,” *Phys. Rev. B*, vol. 81, no. 15, pp. 1–13, 2010.
- [34] E. J. Meijer *et al.*, “Switch-on voltage in disordered organic field-effect transistors,” *Appl. Phys. Lett.*, vol. 80, no. 20, pp. 3838–3840, 2002.
- [35] T. K. Maiti, L. Chen, H. Zenitani, H. Miyamoto, H. J. Mattausch, and S. Member, “Physically based Compact Mobility Model for Organic Thin-Film Transistor,” *IEEE Trans. Electron Devices*, vol. 63, no. 5, pp. 2057–2065, 2016.
- [36] L. Wang, N. Lu, L. Li, Z. Ji, W. Banerjee, and M. Liu, “Compact model for organic thin-film transistor with Gaussian density of states,” *AIP Adv.*, vol. 5, no. 4, 2015.

- [37] L. Li, K. S. Chung, and J. Jang, “Field effect mobility model in organic thin film transistor,” *Appl. Phys. Lett.*, vol. 98, no. 2, pp. 1–5, 2011.
- [38] N. Lu, D. Geng, L. Li, and M. Liu, “A review for polaron dependent charge transport in organic semiconductor,” *Org. Electron.*, vol. 61, no. May, pp. 223–234, 2018.
- [39] N. A. Li, W. Deng, W. Wu, Z. Luo, and J. Huang, “A Mobility Model Considering Temperature and Contact Resistance in Organic Thin-Film Transistors,” *J. Electron Device Soc.*, vol. 8, no. January, pp. 189–194, 2020.
- [40] J. A. Del Alamo and E. S. Lee, “Stability and Reliability of Lateral GaN Power Field-Effect Transistors,” *IEEE Transactions on Electron Devices*, vol. 66, no. 11. Institute of Electrical and Electronics Engineers Inc., pp. 4578–4590, 01-Nov-2019.
- [41] U. Zschieschang *et al.*, “Megahertz operation of flexible low-voltage organic thin-film transistors,” *Org. Electron.*, vol. 14, no. 6, pp. 1516–1520, 2013.
- [42] M. L. Chabinyc and A. Salleo, “Materials requirements and fabrication of active matrix arrays of organic thin-film transistors for displays,” *Chem. Mater.*, vol. 16, no. 23, pp. 4509–4521, 2004.
- [43] H. Klauk, U. Zschieschang, J. Pflaum, and M. Halik, “Ultralow-power organic complementary circuits.,” *Nature*, vol. 445, no. 7129, pp. 745–748, 2007.
- [44] C. D. Dimitrakopoulos and P. R. L. Malenfant, “Organic thin film transistors for large area electronics,” *Adv. Mater.*, vol. 14, no. 2, pp. 99–117, 2002.
- [45] D. Shamiryan, T. Abell, F. Iacopi, and K. Maex, “Low-k dielectric materials,” *Mater. Today*, vol. 7, no. 1, pp. 34–39, 2004.
- [46] X. Guo *et al.*, “Current Status and Opportunities of Organic Thin-Film Transistor Technologies,” *IEEE Trans. Electron Devices*, vol. 64, no. 5, pp. 1906–1921, 2017.
- [47] W. Xu *et al.*, “Flexible All-organic, All-solution Processed Thin Film Transistor Array with Ultrashort Channel,” *Sci. Rep.*, vol. 6, Jul. 2016.
- [48] W. Tang *et al.*, “Recent progress in printable organic field effect transistors,” *J. Mater. Chem. C*, vol. 7, no. 4, pp. 790–808, 2019.
- [49] B. Kumar, B. K. Kaushik, and Y. S. Negi, “Perspectives and challenges for organic thin film transistors: Materials, devices, processes and applications,” *J. Mater. Sci. Mater. Electron.*, vol. 25, no. 1, pp. 1–30, 2014.
- [50] U. Zschieschang and H. Klauk, “Organic transistors on paper: A brief review,” *J. Mater. Chem. C*, vol. 7, no. 19, pp. 5522–5533, May 2019.
- [51] C. Y. Han, Y. X. Ma, W. M. Tang, X. L. Wang, and P. T. Lai, “A study on pentacene organic thin-film transistor with different gate materials on various substrates,” *IEEE Electron Device Lett.*, vol. 38, no. 6, pp. 744–747, Jun. 2017.
- [52] Y. Zhou *et al.*, “A Universal Method to Produce Low-Work Function Electrodes for Organic Electronics,” *Science (80-.).*, vol. 336, no. 6079, pp. 327–332, 2012.
- [53] C. Liu, Y. Xu, and Y. Y. Noh, “Contact engineering in organic field-effect transistors,” *Mater. Today*, vol. 18, no. 2, 2015.
- [54] A. J. Heeger, “Semiconducting polymers: the Third Generation,” *Chem. Soc. Rev.*, vol. 39, no. 7, pp. 2354–2371, 2010.
- [55] G. Bazan, M. R. Bryce, and M. R. Bryce, “Themed issue on small molecules and monodisperse oligomers for organic electronics,” *J. Mater. Chem. C*, vol. 4, no. 17, pp. 3675–3676, 2016.
- [56] W. Boukhili, M. Mahdouani, R. Bourguiga, and J. Puigdollers, “Microelectronic Engineering Temperature dependence of the electrical properties of organic thin- fi lm

- transistors based on tetraphenyldibenzoperifl anthene deposited at different substrate temperatures : Experiment and modeling," *Microelectron. Eng.*, vol. 150, pp. 47–56, 2016.
- [57] U. Kraft, J. E. Anthony, E. Ripaud, M. A. Loth, E. Weber, and H. Klauk, "Low-voltage organic transistors based on tetraceno[2,3- b]thiophene: Contact resistance and air stability," *Chem. Mater.*, vol. 27, no. 3, pp. 998–1004, 2015.
 - [58] J. M. J. F. Amanda R. Murphy, "Organic semiconducting oligomers for use in thin film transistors," *Chem. Rev.*, vol. 107, no. 4, pp. 1066–1096, 2007.
 - [59] M. H. Choi, B. S. Kim, and J. Jang, "High-performance flexible TFT circuits using TIPS pentacene and polymer blend on plastic," *IEEE Electron Device Lett.*, vol. 33, no. 11, pp. 1571–1573, 2012.
 - [60] T. W. Kelley *et al.*, "Recent progress in organic electronics: Materials, devices, and processes," *Chem. Mater.*, vol. 16, no. 23, pp. 4413–4422, 2004.
 - [61] A. Facchetti, "Semiconductors for organic transistors," *Mater. Today*, vol. 10, no. 3, pp. 28–37, 2007.
 - [62] U. Zschieschang *et al.*, "Dinaphtho[2,3-b:2',3'-f]thieno[3,2-b]thiophene (DNTT) thin-film transistors with improved performance and stability," *Org. Electron.*, vol. 12, no. 8, pp. 1370–1375, 2011.
 - [63] B. Peng and P. K. L. Chan, "Flexible organic transistors on standard printing paper and memory properties induced by floated gate electrode," *Org. Electron.*, vol. 15, no. 1, pp. 203–210, 2014.
 - [64] S. H. Kim, S. H. Lee, and J. Jang, "High-performance n-channel organic thin-film transistor for CMOS circuits using electron-donating self-assembled layer," *IEEE Electron Device Lett.*, vol. 31, no. 9, pp. 1044–1046, 2010.
 - [65] X. Shao, S. Wang, X. Li, Z. Su, Y. Chen, and Y. Xiao, "Single component p-, ambipolar and n-type OTFTs based on fluorinated copper phthalocyanines," *Dye. Pigment.*, vol. 132, pp. 378–386, 2016.
 - [66] F. Torricelli *et al.*, "Unified drain-current model of complementary p- and n-type OTFTs," *Org. Electron.*, vol. 22, pp. 5–11, 2015.
 - [67] H. E. Katz *et al.*, "A soluble and air-stable organic semiconductor with high electron mobility," *Nature*, vol. 404, no. 6777, pp. 478–481, 2000.
 - [68] W. Wang, J. Han, J. Ying, L. Xiang, and W. Xie, "Low-voltage p-channel, n-channel and ambipolar organic thin-film transistors based on an ultrathin inorganic/polymer hybrid gate dielectric layer," *Org. Electron.*, vol. 15, no. 10, pp. 2568–2574, 2014.
 - [69] J. T. E. Quinn, J. Zhu, X. Li, J. Wang, and Y. Li, "Recent progress in the development of n-type organic semiconductors for organic field effect transistors," *J. Mater. Chem. C*, vol. 5, no. 34, pp. 8654–8681, Aug. 2017.
 - [70] H. F. Haneef, A. M. Zeidell, and O. D. Jurchescu, "Charge carrier traps in organic semiconductors: A review on the underlying physics and impact on electronic devices," *Journal of Materials Chemistry C*, vol. 8, no. 3. Royal Society of Chemistry, pp. 759–787, 23-Jan-2020.
 - [71] H. Sun, X. Guo, and A. Facchetti, "High-Performance n-Type Polymer Semiconductors: Applications, Recent Development, and Challenges," *Chem.*, vol. 6, no. 6, pp. 1310–1326, Jun. 2020.
 - [72] T. W. Kelley, L. D. Boardman, T. D. Dunbar, D. V Muyres, M. J. Pellerite, and T. P. Smith, "High-performance OTFTs using surface-modified alumina dielectrics," *J. Phys. Chem. B*, vol. 107, no. 24, pp. 5877–5881, 2003.

- [73] L. F. Deng *et al.*, “Effects of different annealing gases on pentacene OTFT with HfLaO gate dielectric,” *IEEE Electron Device Lett.*, vol. 32, no. 1, pp. 93–95, 2011.
- [74] C. Y. Wei, S. H. Kuo, Y. M. Hung, W. C. Huang, F. Adriyanto, and Y. H. Wang, “High-mobility pentacene-based thin-film transistors with a solution-processed barium titanate insulator,” *IEEE Electron Device Lett.*, vol. 32, no. 1, pp. 90–92, 2011.
- [75] C. Y. Han, W. M. Tang, C. H. Leung, C. Che, P. T. Lai, and S. Member, “A Study on La Incorporation in Transition-Metal (Y, Zr, and Nb) Oxides as Gate Dielectric of Pentacene Organic Thin-Film Transistor,” *IEEE Trans. Electron Devices*, vol. 62, no. 7, pp. 2313–2319, 2015.
- [76] J. Puigdollers, “Pentacene thin-film transistors with polymeric gate dielectric,” *Org. Electron.*, vol. 5, no. 1–3, pp. 67–71, 2004.
- [77] M. Petrosino, A. Rubino, R. Miscioscia, A. G. Del De Mauro, and C. Minarini, “Effects of the polymeric dielectric on OTFT performances,” *3rd Int. Conf. Signals, Circuits Syst. SCS 2009*, pp. 1–4, 2009.
- [78] F. C. Chen, C. W. Chu, J. He, Y. Yang, and J. L. Lin, “Organic thin-film transistors with nanocomposite dielectric gate insulator,” *Appl. Phys. Lett.*, vol. 85, no. 15, pp. 3295–3297, 2004.
- [79] H. Klauk, M. Halik, U. Zschieschang, G. Schmid, W. Radlik, and W. Weber, “High-mobility polymer gate dielectric pentacene thin film transistors,” *J. Appl. Phys.*, vol. 92, no. 9, pp. 5259–5263, 2002.
- [80] B. J. C. Woo Cheol Shin, Hanul Moon, Seunghyup Yoo, “Organic/Inorganic Hybrid Gate Dielectric for High-Performance and low poer organic thin-film transistors,” in *Proceedings of 10th IEEE international conference on Nanotechnology Joint Symposium with Nano Korea 2010*, 2010, pp. 936–939.
- [81] A. L. Deman and J. Tardy, “PMMA-Ta₂O₅ bilayer gate dielectric for low operating voltage organic FETs,” *Org. Electron. physics, Mater. Appl.*, vol. 6, no. 2, pp. 78–84, 2005.
- [82] D. Oberhoff, K. P. Pernstich, D. J. Gundlach, and B. Batlogg, “Arbitrary density of states in an organic thin-film field-effect transistor model and application to pentacene devices,” *IEEE Trans. Electron Devices*, vol. 54, no. 1, pp. 17–25, 2007.
- [83] R. H?usermann *et al.*, “Device performance and density of trap states of organic and inorganic field-effect transistors,” *Org. Electron. physics, Mater. Appl.*, vol. 28, pp. 306–313, 2016.
- [84] J. Dacuña and A. Salleo, “Modeling Space-Charge Limited Currents in Organic Semiconductors : Extracting Trap Density and Mobility,” *Phys. Rev. B*, vol. 84, pp. 1–9, 2011.
- [85] W. S. C. Roelofs, S. G. J. Mathijssen, R. A. J. Janssen, D. M. De Leeuw, and M. Kemerink, “Accurate description of charge transport in organic field effect transistors using an experimentally extracted density of states,” *Phys. Rev. B - Condens. Matter Mater. Phys.*, vol. 85, no. 8, pp. 1–6, 2012.
- [86] W. L. Kalb and B. Batlogg, “Calculating the trap density of states in organic field-effect transistors from experiment: A comparison of different methods,” *Phys. Rev. B*, vol. 81, no. 3, p. 035327, Jan. 2010.
- [87] B. Iñiguez *et al.*, “Universal compact model for long- and short-channel Thin-Film Transistors,” *Solid. State. Electron.*, vol. 52, no. 3, pp. 400–405, 2008.
- [88] L. Torricelli, F., Kovács-Vajna, Z. M., & Colalongo, “A charge-based OTFT model for circuit simulation,” *IEEE Trans. Electron Devices*, vol. 56, no. 1, pp. 20–30, 2009.

- [89] T. K. Maiti *et al.*, “A surface potential based organic thin-film transistor model for circuit simulation verified with DNTT high performance test devices,” *IEEE Trans. Semicond. Manuf.*, vol. 27, no. 2, pp. 159–168, 2014.
- [90] V. Vaidya, J. Kim, J. N. Haddock, B. Kippelen, and D. Wilson, “SPICE optimization of organic FET models using charge transport elements,” *IEEE Trans. Electron Devices*, vol. 56, no. 1, pp. 38–42, 2009.
- [91] P. Ortiz, A. Facchetti, and T. J. Marks, “High- k Organic , Inorganic , and Hybrid Dielectrics for Low-Voltage Organic Field-Effect Transistors,” *Chem. Rev.*, vol. 110, pp. 205–239, 2010.
- [92] L. Shang *et al.*, “Threshold voltage tuning of low-voltage organic thin-film transistors,” *IEEE Trans. Electron Devices*, vol. 58, no. 7, pp. 2127–2134, 2011.
- [93] C. Bartic, H. Jansen, A. Campitelli, and S. Borghs, “Ta₂O₅ as gate dielectric material for low-voltage organic thin-film transistors,” *Org. Electron.*, vol. 3, no. 2, pp. 65–72, 2002.
- [94] C. D. Dimitrakopoulos, “Low-Voltage Organic Transistors on Plastic Comprising High-Dielectric Constant Gate Insulators,” *Science (80-.).*, vol. 283, no. 5403, pp. 822–824, 1999.
- [95] Tang, W M, H. MG, G. MT, L. ZH, and N. WT, “Improved characteristics of OTFT with HfO₂ Gate Dielectric by Using Chlorinated Indium Tin Oxide Gate Electrode,” in *IEEE International conference on Electronic Devices and Solid State Circuits (EDSSC)*, 2016, pp. 0–3.
- [96] A. Facchetti, M.-H. Yoon, and T. J. Marks, “Gate Dielectrics for Organic Field-Effect Transistors: New Opportunities for Organic Electronics,” *Adv. Mater.*, vol. 17, no. 14, pp. 1705–1725, 2005.
- [97] Y. Harima, K. Kubota, Y. Ishiguro, Y. Ooyama, and I. Imae, “Electrical Characteristics of Pentacene Films on Cross-Linked Polymeric Insulators of Varying Thicknesses,” *ACS Omega*, vol. 1, no. 5, pp. 784–788, 2016.
- [98] L. Feng, Q. Cui, J. Zhao, W. Tang, and X. Guo, “Dual-Vth Low-Voltage Solution Processed Organic Thin-Film Transistors With a Thick Polymer Dielectric Layer,” *IEEE Trans. Electron Devices*, vol. 61, no. 6, pp. 2220–2223, 2014.
- [99] J. Kim *et al.*, “Characteristics of pentacene with different polymer gate insulators for organic thin-film transistors,” *Solid State Phenom.*, vol. 124, pp. 451–454, 2007.
- [100] W. L. Kalb, T. Mathis, S. Haas, A. F. Stassen, and B. Batlogg, “Organic small molecule field-effect transistors with Cytop gate dielectric: Eliminating gate bias stress effects,” *Appl. Phys. Lett.*, vol. 90, no. 9, pp. 88–91, 2007.
- [101] X. Cheng *et al.*, “Air stable cross-linked cytop ultrathin gate dielectric for high yield low-voltage top-gate organic field-effect transistors,” *Chem. Mater.*, vol. 22, no. 4, pp. 1559–1566, 2010.
- [102] S. Gross, D. Camozzo, V. Di Noto, L. Armelao, and E. Tondello, “PMMA: A key macromolecular component for dielectric low-k hybrid inorganic-organic polymer films,” *Eur. Polym. J.*, vol. 43, no. 3, pp. 673–696, 2007.
- [103] M. Estrada, I. Mejia, A. Cerdeira, and B. Iñiguez, “MIS polymeric structures and OTFTs using PMMA on P3HT layers,” *Solid. State. Electron.*, vol. 52, no. 1, pp. 53–59, 2008.
- [104] T. N. Ng, J. H. Daniel, S. Sambandan, A.-C. Arias, M. L. Chabinyc, and R. a Street, “Gate bias stress effects due to polymer gate dielectrics in organic thin-film transistors,” *J. Appl. Phys.*, vol. 103, no. 4, p. 044506, 2008.
- [105] U. Haas *et al.*, “Hybrid polymers as tunable and directly-patternable gate dielectrics in

- organic thin-film transistors,” *Phys. Rev. B - Condens. Matter Mater. Phys.*, vol. 73, no. 23, pp. 1–7, 2006.
- [106] Y. Lu, W. H. Lee, H. S. Lee, Y. Jang, and K. Cho, “Low-voltage organic transistors with titanium oxide/polystyrene bilayer dielectrics,” *Appl. Phys. Lett.*, vol. 94, no. 11, pp. 108–111, 2009.
 - [107] H.-L. Hsu, W.-C. Yang, Y.-L. Lee, and T.-R. Yew, “Polyacrylonitrile as a gate dielectric material,” *Appl. Phys. Lett.*, vol. 91, no. 2, p. 023501, 2007.
 - [108] E. Orgiu, S. Locci, B. Fraboni, E. Scavetta, P. Lugli, and A. Bonfiglio, “Analysis of the hysteresis in organic thin-film transistors with polymeric gate dielectric,” *Org. Electron. physics, Mater. Appl.*, vol. 12, no. 3, pp. 477–485, 2011.
 - [109] P. Sharma and N. Gupta, “Investigation on material selection for gate dielectric in nanocrystalline silicon (nc-Si) top-gated thin film transistor (TFT) using Ashby’s , VIKOR and TOPSIS,” *J. Mater. Sci. Mater. Electron.*, vol. 26, no. 12, pp. 9607–9613, 2015.
 - [110] K. Kandpal and N. Gupta, “Investigations on high- k dielectrics for low threshold voltage and low leakage zinc oxide thin-film transistor , using material selection methodologies,” *J. Mater. Sci. Mater. Electron.*, vol. 27, no. 6, pp. 5972–5981, 2016.
 - [111] A. Kumar, B. Sah, A. R. Singh, Y. Deng, X. He, and P. Kumar, “A review of multi criteria decision making (MCDM) towards sustainable renewable energy development,” *Renew. Sustain. Energy Rev.*, vol. 69, no. October 2016, pp. 596–609, 2017.
 - [112] M. Behzadian, S. K. Otaghsara, M. Yazdani, and J. Ignatius, “Expert Systems with Applications A state-of-the-art survey of TOPSIS applications,” *Expert Syst. Appl.*, vol. 39, no. 17, pp. 13051–13069, 2012.
 - [113] B. G. Horowitz, R. Hajlaoui, and H. Bouchriha, “The Concept of ‘Threshold Voltage’ in Organic Field-Effect Transistors,” *Adv. Mater.*, vol. 10, no. 12, pp. 923–927, 1998.
 - [114] J. F. Martínez Hardigree and H. E. Katz, “Through thick and thin: Tuning the threshold voltage in organic field-effect transistors,” *Acc. Chem. Res.*, vol. 47, no. 4, pp. 1369–1377, 2014.
 - [115] W.-Y. Chou *et al.*, “Effect of surface free energy in gate dielectric in pentacene thin-film transistors,” *Appl. Phys. Lett.*, vol. 89, no. 11, p. , 2006.
 - [116] T. Matsumoto, W. Ou-Yang, K. Miyake, T. Uemura, and J. Takeya, “Study of contact resistance of high-mobility organic transistors through comparisons,” *Org. Electron. physics, Mater. Appl.*, vol. 14, no. 10, pp. 2590–2595, 2013.
 - [117] T. N. Ng, J. H. Daniel, S. Sambandan, A.-C. Arias, M. L. Chabinyc, and R. A. Street, “Gate bias stress effects due to polymer gate dielectrics in organic thin-film transistors,” *J. Appl. Phys.*, vol. 103, no. 4, p. 044506, 2008.
 - [118] T. H. Huang, Z. Pei, W. K. Lin, S. T. Chang, and K. C. Liu, “Oligomer semiconductor/dielectric interface modification for organic thin film transistor hysteresis reduction,” *Thin Solid Films*, vol. 518, no. 24, pp. 7381–7384, 2010.
 - [119] Y. H. Noh, S. Young Park, S. M. Seo, and H. H. Lee, “Root cause of hysteresis in organic thin film transistor with polymer dielectric,” *Org. Electron. physics, Mater. Appl.*, vol. 7, no. 5, pp. 271–275, 2006.
 - [120] D. Guo, S. Ikeda, K. Saiki, H. Miyazoe, and K. Terashima, “Effect of annealing on the mobility and morphology of thermally activated pentacene thin film transistors,” *J. Appl. Phys.*, vol. 99, no. 9, pp. 1–7, 2006.
 - [121] K. Fukuda, T. Sekitani, T. Someya, K. Fukuda, T. Sekitani, and T. Someya, “Effects of

- annealing on electronic and structural characteristics of pentacene thin-film transistors on polyimide gate dielectrics Effects of annealing on electronic and structural characteristics of pentacene thin-film transistors on polyimide gate dielectric,” vol. 023302, pp. 2–5, 2009.
- [122] T. Ahn, Y. Choi, H. M. Jung, and M. Yi, “Fully aromatic polyimide gate insulators with low temperature processability for pentacene organic thin-film transistors,” *Org. Electron.*, vol. 10, no. 1, pp. 12–17, 2009.
 - [123] S. Faraji *et al.*, “Improved performance of pentacene field-effect transistors using a polyimide gate dielectric layer,” *J. Phys. D*, vol. 38, no. 8, pp. 1148–1151, 2005.
 - [124] V. C.-Y. Shih, T. A. Harder, and Y.-C. Tai, “Yield strength of thin-film parylene-C,” in *Design, Test, Integration and Packaging of MEMS/MOEMS 2003*, 2003, no. May, pp. 5–7.
 - [125] M. Iazykov, M. Erouel, J. Tardy, V. A. Skryshevsky, and M. Phaner-Goutorbe, “Atomic force microscopy analysis of morphology of thin pentacene films deposited on parylene-C and benzocyclobutene,” *Surf. Sci.*, vol. 607, pp. 170–173, 2013.
 - [126] D. Prime and S. Paul, “Electrical and morphological properties of polystyrene thin films for organic electronic applications,” *Vaccum*, vol. 84, no. 10, pp. 1240–1243, 2010.
 - [127] C. Jung, A. Maliakal, A. Sidorenko, and T. Siegrist, “Pentacene-based thin film transistors with titanium oxide-polystyrene/polystyrene insulator blends: High mobility on high K dielectric films,” *Appl. Phys. Lett.*, vol. 90, no. 6, 2007.
 - [128] L. Chua *et al.*, “General observation of n-type field-effect behaviour in organic semiconductors,” *Nature*, vol. 434, no. 7030, pp. 194–199, 2005.
 - [129] J. H. Park, D. K. Hwang, J. Lee, S. Im, and E. Kim, “Studies on poly(methyl methacrylate) dielectric layer for field effect transistor: Influence of polymer tacticity,” *Thin Solid Films*, vol. 515, no. 7–8, pp. 4041–4044, 2007.
 - [130] J. Wünsche *et al.*, “The correlation between gate dielectric, film growth, and charge transport in organic thin film transistors: the case of vacuum-sublimed tetracene thin films,” *J. Mater. Chem. C*, vol. 1, no. 5, pp. 967–976, 2013.
 - [131] M. Na and S. W. Rhee, “Electronic characterization of Al/PMMA[poly(methyl methacrylate)]/p-Si and Al/CEP(cyanoethyl pullulan)/p-Si structures,” *Org. Electron. physics, Mater. Appl.*, vol. 7, no. 4, pp. 205–212, 2006.
 - [132] E. Y. Shin, E. Y. Choi, and Y. Y. Noh, “Parylene based bilayer flexible gate dielectric layer for top-gated organic field-effect transistors,” *Org. Electron. physics, Mater. Appl.*, vol. 46, pp. 14–21, 2017.
 - [133] I. Doi, M. J. Kang, and K. Takimiya, “High mobility organic thin-film transistors on plastic substrate,” in *Current Applied Physics*, 2012, vol. 12, no. SUPPL. 1, p. e2.
 - [134] Y. H. Kim, S. K. Park, D. G. Moon, W. K. Kim, and J. I. Han, “Active-matrix liquid crystal display using solution-based organic thin film transistors on plastic substrates,” *Displays*, vol. 25, no. 5, pp. 167–170, Dec. 2004.
 - [135] Z. R. Wang *et al.*, “Low power flexible organic thin film transistors with amorphous Ba 0.7Sr 0.3TiO 3 gate dielectric grown by pulsed laser deposition at low temperature,” *Org. Electron. physics, Mater. Appl.*, vol. 13, no. 7, pp. 1223–1228, 2012.
 - [136] A. Valletta *et al.*, “A compact Spice model for organic TFTs and applications to logic circuit design,” *IEEE-NANO 2015 - 15th Int. Conf. Nanotechnol.*, vol. 15, no. 5, pp. 1434–1437, 2016.
 - [137] J. Shi, M. B. Chan-Park, Y. Wang, H. Yang, and C. M. Li, “A micropatterning technique to fabricate organic thin-film transistors on various substrates,” *J. Mater. Chem.*, vol.

- 21, no. 40, pp. 16184–16189, Oct. 2011.
- [138] G. S. Ryu, S. H. Jeong, B. C. Park, B. Park, and C. K. Song, “Fabrication of organic thin film transistors on Polyethylene Terephthalate (PET) fabric substrates,” *Org. Electron.*, vol. 15, no. 7, pp. 1672–1677, Jul. 2014.
- [139] M. F. Chang, P. T. Lee, S. P. McAlister, and A. Chin, “Small-subthreshold-swing and low-voltage flexible organic thin-film transistors which use HfLaO as the gate dielectric,” *IEEE Electron Device Lett.*, vol. 30, no. 2, pp. 133–135, 2009.
- [140] C. Y. Han, P. T. Lai, and W. M. Tang, “High-Performance Pentacene Organic Thin-Film Transistor Based on Room-Temperature-Processed Hf_{0.13} La_{0.87}O as Gate Dielectric,” *IEEE Electron Device Lett.*, 2021.
- [141] J. H. Kwon, S. Il Shin, J. Choi, M. H. Chung, H. Kang, and B. K. Ju, “A flexible organic thin-film transistor with 6,13-bis(triisopropylsilylithynyl)pentacene and a methylsiloxane-based dielectric,” *Solid. State. Electron.*, vol. 53, no. 3, pp. 266–270, Mar. 2009.
- [142] K. D. Harris, A. L. Elias, and H. J. Chung, “Flexible electronics under strain: a review of mechanical characterization and durability enhancement strategies,” *Journal of Materials Science*, vol. 51, no. 6. Springer New York LLC, pp. 2771–2805, 01-Mar-2016.
- [143] S. Zhou, M. Li, Q. Tang, Z. Song, Y. Tong, and Y. Liu, “Deposition of Pentacene Thin Film on Polydimethylsiloxane Elastic Dielectric Layer for Flexible Thin-Film Transistors,” *IEEE Electron Device Lett.*, vol. 38, no. 8, pp. 1031–1034, Aug. 2017.
- [144] O. A. Melville, B. H. Lessard, and T. P. Bender, “Phthalocyanine-Based Organic Thin-Film Transistors: A Review of Recent Advances,” *ACS Appl. Mater. Interfaces*, vol. 7, no. 24, pp. 13105–13118, 2015.
- [145] K. B. R. Teja and N. Gupta, “Low-k polymer gate dielectric selection for organic thin-film transistors (OTFTs) using material selection methodologies,” *J. Comput. Electron.*, vol. 18, no. 3, pp. 872–881, 2019.
- [146] Q. H. Lu and F. Zheng, “Polyimides for electronic applications,” in *Advanced Polyimide Materials: Synthesis, Characterization, and Applications*, S.-Y. Yang, Ed. Elsevier, 2018, pp. 195–255.
- [147] S. E. Root, S. Savagatrup, A. D. Printz, D. Rodriguez, and D. J. Lipomi, “Mechanical Properties of Organic Semiconductors for Stretchable, Highly Flexible, and Mechanically Robust Electronics,” *Chemical Reviews*, vol. 117, no. 9. American Chemical Society, pp. 6467–6499, 10-May-2017.
- [148] D. Yu, Y. Q. Yang, Z. Chen, Y. Tao, and Y. F. Liu, “Recent progress on thin-film encapsulation technologies for organic electronic devices,” *Opt. Commun.*, vol. 362, pp. 43–49, Mar. 2016.
- [149] J. Lewis, “Material challenge for flexible organic devices,” *Mater. Today*, vol. 9, no. 4, pp. 38–45, Apr. 2006.
- [150] D. Li, E. J. Borkent, R. Nortrup, H. Moon, H. Katz, and Z. Bao, “Humidity effect on electrical performance of organic thin-film transistors,” *Appl. Phys. Lett.*, vol. 86, no. 4, p. 042105, Jan. 2005.
- [151] D. Kumaki, T. Umeda, and S. Tokito, “Influence of H₂O and O₂ on threshold voltage shift in organic thin-film transistors: Deprotonation of SiOH on Si O₂ gate-insulator surface,” *Appl. Phys. Lett.*, vol. 92, no. 9, p. 093309, Mar. 2008.
- [152] Z. Ding *et al.*, “Effect of oxygen, moisture and illumination on the stability and reliability of dinaphtho[2,3-b:2',3'-f]thieno[3,2-b]thiophene (DNTT) OTFTs during operation and storage,” *ACS Appl. Mater. Interfaces*, vol. 6, no. 17, pp. 15224–15231,

Sep. 2014.

- [153] Y. Su, J. Jiang, N. Ke, N. Zhao, W. Xie, and J. Xu, “Low-voltage flexible pentacene thin film transistors with a solution-processed dielectric and modified copper source-drain electrodes,” *J. Mater. Chem. C*, vol. 1, no. 14, pp. 2585–2592, 2013.
- [154] S. Park, K. Cho, H. Oh, and S. Kim, “Electrical and mechanical characteristics of fully transparent IZO thin-film transistors on stress-relieving bendable substrates,” *Appl. Phys. Lett.*, vol. 109, no. 14, p. 143504, Oct. 2016.
- [155] B. O’Connor *et al.*, “Correlations between mechanical and electrical properties of polythiophenes,” *ACS Nano*, vol. 4, no. 12, pp. 7538–7544, Dec. 2010.
- [156] G. R. Jahanshahloo, F. Hosseinzadeh Lotfi, and A. R. Davoodi, “Extension of TOPSIS for decision-making problems with interval data: Interval efficiency,” *Math. Comput. Model.*, vol. 49, no. 5, pp. 1137–1142, Mar. 2009.
- [157] M. Rapisarda *et al.*, “Self-heating effects on the electrical instability of fully printed p-type organic thin film transistors,” *Appl. Phys. Lett.*, vol. 101, no. 23, p. 233304, Dec. 2012.
- [158] R. H. Liu, S. Q. Yang, X. J. Li, Y. Bin Sun, and Y. L. Shi, “Electrothermal Model Parameters Extraction and Evaluation Based on BSIM-CMG for 7-nm Nanosheet Gate-All-Around Transistor,” in *2020 IEEE 15th International Conference on Solid-State and Integrated Circuit Technology, ICSICT 2020 - Proceedings*, 2020.
- [159] F. Torricelli, “Charge Transport in Organic Transistors Accounting for a Wide Distribution of Carrier Energies - Part I: Theory,” *IEEE Trans. Electron Devices*, vol. 59, no. 5, pp. 1514–1519, 2012.
- [160] H. He, Y. Liu, B. Yan, X. Lin, X. Zheng, and S. Zhang, “Analytical Drain Current Model for Amorphous InGaZnO Thin-Film Transistors at Different Temperatures Considering Both Deep and Tail Trap States,” *IEEE Trans. Electron Devices*, vol. 64, no. 9, pp. 3654–3660, 2017.
- [161] L. Colalongo, M. Ghittorelli, F. Torricelli, and Z. M. Kovács-Vajna, “Accurate analytical approximation of the OTFTs surface potential by means of the Lagrange Reversion Theorem,” *Solid. State. Electron.*, vol. 114, pp. 14–16, 2015.
- [162] M. Fayed, K. M. Morsi, and M. N. Sabry, “OTFTs compact models: analysis, comparison, and insights,” *IET Circuits, Devices Syst.*, vol. 11, no. 5, pp. 409–420, 2017.
- [163] N. Lu, W. Jiang, Q. Wu, D. Geng, L. Li, and M. Liu, “A Review for Compact Model of Thin-Film Transistors (TFTs),” *Micromachines*, vol. 9, no. 11, pp. 599–625, 2018.
- [164] G. Gildenblat, S. Member, X. Li, W. Wu, and H. Wang, “PSP : An Advanced Surface-Potential-Based MOSFET Model for Circuit Simulation,” *IEEE Trans. Electron Devices*, vol. 53, no. 9, pp. 1979–93, 2006.
- [165] H. He, Y. Liu, B. Yan, X. Lin, X. Zheng, and S. Zhang, “Analytical Drain Current Model for Organic Thin-Film Transistors at Different Temperatures Considering Both Deep and Tail Trap States,” *IEEE Trans. Electron Devices*, vol. 63, no. 11, pp. 4423–4431, 2016.
- [166] Z. Zong, L. Li, J. Jang, N. Lu, and M. Liu, “Analytical surface-potential compact model for amorphous-IGZO thin-film transistors,” *J. Appl. Phys.*, vol. 117, no. 21, p. 215705, Jun. 2015.
- [167] F. Yu, X. Ma, W. Deng, J. J. Liou, and J. Huang, “A surface-potential-based drain current compact model for a-InGaZnO thin-film transistors in Non-Degenerate conduction regime,” *Solid. State. Electron.*, vol. 137, pp. 38–43, 2017.

- [168] L. Colalongo, “Analytical approximation of the InGaZnO thin-film transistors surface potential,” *Solid. State. Electron.*, vol. 124, pp. 1–4, 2016.
- [169] N. Lu, L. Li, W. Banerjee, P. Sun, Gao Nan, and M. Liu, “Charge carrier hopping transport based on Marcus theory and variable-range hopping theory in organic semiconductors,” *J. Appl. Phys.*, vol. 118, no. May, p. 045701, 2015.
- [170] C. W. Chu, S. H. Li, C. W. Chen, V. Shrotriya, and Y. Yang, “High-performance organic thin-film transistors with metal oxide/metal bilayer electrode,” *Appl. Phys. Lett.*, vol. 87, no. 19, pp. 1–3, 2005.
- [171] W. T. Wondmagegn *et al.*, “Impact of semiconductor/metal interfaces on contact resistance and operating speed of organic thin film transistors,” *J. Comput. Electron.*, vol. 10, no. 1–2, pp. 144–153, 2011.
- [172] K. Kandpal and N. Gupta, “Adaptation of a compact SPICE level 3 model for oxide thin-film transistors,” *J. Comput. Electron.*, vol. 18, no. 3, pp. 1037–1044, 2019.
- [173] S. D. Brotherton, *Introduction to Thin Film Transistors*, 1st ed. Springer International Publishing, 2013.
- [174] P. V. Necliudov, M. S. Shur, D. J. Gundlach, and T. N. Jackson, “Modeling of organic thin film transistors of different designs,” *J. Appl. Phys.*, vol. 88, no. 11, p. 6594, 2000.
- [175] N. Karl, “Charge carrier transport in organic semiconductors,” *Synth. Met.*, vol. 133–134, pp. 649–657, 2003.
- [176] A. Ortiz-Conde, F. J. García Sánchez, J. J. Liou, A. Cerdeira, M. Estrada, and Y. Yue, “A review of recent MOSFET threshold voltage extraction methods,” *Microelectron. Reliab.*, vol. 42, no. 4–5, pp. 583–596, 2002.
- [177] A. Vladimirescu and S. Liu, “The Simulation of MOS Integrated Circuits Using SPICE2,” 1980.
- [178] Y. Taur and T. H. Ning, *Fundamentals of Modern VLSI Devices*. 2009.