# **BAQUER MAZHARI**

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# EDUCATIONAL RECORD

Jan. 1990-May 1993	University of Illinois at Urbana Champaign Ph.D. in Electrical Engineering
Aug. 1987-Dec. 1990	University of Maryland at College Park M.S. in Electrical Engineering
July 1983-July 1987	Indian Institute of Technology, Kharagpur, India B.Tech.(Hons.) in Electronics and Electrical Communication Engineering

## WORK EXPERIENCE

Oct. 1993- Jan. 2001	Assistant Professor Department of Electrical Engineering Indian Institute of Technology, Kanpur, India
Jan. 2001- Dec. 2005	Associate Professor Department of Electrical Engineering Indian Institute of Technology, Kanpur, India
Dec. 2005 - present	Professor Department of Electrical Engineering Indian Institute of Technology, Kanpur, India

# CURRENT RESEARCH INTERESTS

Organic Semiconductor Devices (Thin film transistor, Light emitting diode and Solar Cell); Flexible Electronics

## STUDENTS SUPERVISED

Ph.D: 8 graduated, 2 in progress M. Tech : 112 graduated

## COURSES

-Courses taught include ESC201 (shared on swayam Prabha channel), ESC201P, EE210, EE370, EE380, EE381, EE614, EE698N

Developed six 35-40 hour online courses that are publicly shared.

New courses:

- 1. Introduction to Organic Electronics (Graduate course with laboratory where students got an opportunity to fabricate and test diodes, transistors and solar cells)
- 2. Introduction to Flexible Electronics (Graduate course)
- 3. Introduced more than 10 new design experiments in third year UG laboratory. Introduced a project component where every student gets an opportunity to build an android based embedded system.
- 4. Developed a course (ESC201P) "learning electronics through simulation".

-Offered annual short course related to organic and flexible electronics for about two decades with colleagues at Samtel centre.

## AWARDS

Distinguished Teacher Award, IIT Kanpur, 2015 Gopal Das Bhandari Distinguished Teacher Award, IIT Kanpur, 2019 Excellence in Teaching Award, 2019

# PATENTS

## Granted

- 1. A Polysillicon Amoled Self- Biased Cascode Pixel Circuit with Highly Linear Transfer Characteristics, Baquer Mazhari (EE), Himanshu Joshi and Shashi Bhushan Singh , Indian Patent number 274196. Application number 1774/DEL/2004
- 2. A method of Varying threshold voltage in MOSFETs, S.S.K. Iyer, B. Mazhari, C. Pal, Indian Patent number 258953. Application number 2056/DEL/2005
- A Dynamic logic family using only N or P-type enhancement mode-MOSFET, Ashish Kumar Agarwal, Anil Bawa, B. Mazhari, Indian Patent No. 325232 granted on 14.07.2016. Application 2708/DEL/2007
- 4. A 3d Integrated Universal Digital Gate, Mazhari, Baquer Mazhari, Ankita Gangwar, Indian Patent no 333504. Application 201611005433
- "Thin Film Transistor With A Current-Induced Channel" B. Mazhari and A. Gangwar, US patent : 9,515,273 (granted 6/12/2016) (licensed to Intellectual ventures (IV.)
- 6. "An organic device with thin film transistor merged with light emitting diode through use of an accumulation layer in tft as an electrode" B. Mazhari and A. Gangwar. US patent no : US 9536935 (granted Jan. 3,2017) (licensed to Intellectual ventures (IV)
- "Four-Terminal Gate-Controlled Thin-Film organic Thyristor", B. Mazhari, A. Ashok, US patent no : US Patent 9,831,453, 2017
  Indian Complete Patent Application no. 3218/DEL/2013
  (licensed to Intellectual ventures (IV)

# **FILED**

- 8. A Thin Film Transistor with High Drain Current Induced by a Trap assisted Electric Double Layer , B. Mazhari, Ankita Gangwar, 9559754253 201611031394, 14.09.2016
- 9. An Organic Thermistor, B. Mazhari, Syed M. H. Rizvi 201811015509, 24.04.2018
- 10. A Sensor System and Method Thereof , Baquer Mazhari, Biswanath Panda, Suraj Malik 201911004819, 07.02.2019
- 11. A Hybrid Large Area Display Device , Bishwanath Panda, Muralidharan Balakrishnan , Dr. Monica Katiyar, Mazhari Baquer 201911018821, 10.05.2019
- 12. Device for Calibration Free Monitoring of Fluid Level and Method Thereof, Biswanath Panda, Mr. Vignesh Tirumalai Govindasamy, Mr. Suraj Malik 201911022436, 06.06.2019
- 13. Current-driven Active Matrix Sensor Array and Method to Measure Sensor Resistance in the Same , Baquer Mazhari, Mr. Nadeem Firoz, 201911052830, 19.12.2019
- 14. An Active Matrix temperature Sensor using four terminal thin film transistor with diode-like source contact, Baquer Mazhari, Mr. Nadeem Firoz, 202111050367, 12.11.2021

# TECHNOLOGIES DEVLOPED/TRANSFERRED

- 1. FEAT : A Flexible Electronics Axillary Thermometer ready for commercialization.
- 2. A printed circuit based brand protection technique developed jointly with Dr. Y.N. Mohapatra and transferred to Manipal Technologies Ltd.

## SPONSORED PROJECT

Centre For large Area Flexible Electronics. Agency: Department of Electronics and Information Technology, Rs. 133 cr, a 5 year project starting Nov. 2014. The centre was proposed by team of faculty members at Samtel centre while I was coordinator.

## ADMINISTRATIVE POSITIONS

Coordinator, Samtel Centre (2011-2014), Liaison Officer, (DUGC Convener, space committee, budget committee, alumni relations committee at Dept. level)

## PUBLICATIONS

- Firoz, Nadeem; Mazhari, Baquer, "Extraction of Source Resistance in Thin Film Transistors Using a Single Gated-Probe Outside the Channel," Journal of Physics D: Applied Physics, 2020
- 2. S. M. H. Rizvi and B. Mazhari, "Investigation of Traps in Thin-Film Organic Semiconductors Using Differential Analysis of Steady-State Current-Voltage Characteristics," in *IEEE Transactions on Electron Devices*, vol. 65, no. 8, pp. 3430-3437, Aug. 2018.
- R. Agarwal and B. Mazhari, "Floating Drain-Based Measurement of ON-State Voltage of an OTFT for Sensing Applications," in *IEEE Transactions on Electron Devices*, vol. 65, no. 8, pp. 3460-3465, Aug. 2018.

- 4. R. Agarwal and B. Mazhari, "An Organic Temperature Sensor Based on Asymmetric Metal Insulator Semiconductor Capacitor With Electrically Tunable Sensing Area," in *IEEE Sensors Letters*, vol. 2, no. 1, pp. 1-4, March 2018.
- Rizvi, S. M. H. and Mazhari, B. An improved method for extraction of mobility from space charge limited current in organic semiconductor films, Journal of Applied Physics, 121 (15), 155501,2017
- 6. Ankita Gangwar and Baquer Mazhari, A Thin film transistor with high drain current induced by a trap-assisted electric double layer, IEEE Trans. Electron devices, 63 (12), 4776-4781, 2016
- 7. Agarwal, Rajesh and Agarwal, Ashish K. and Mazhari, Baquer, Estimation of carrier mobility at organic semiconductor/insulator interface using an asymmetric capacitive test structure AIP Advances, 6, 045017 (2016)
- 8. Ankita Gangwar and Baquer Mazhari, A Current-Induced Channel Organic Thin-Film Transistor, IEEE Trans. Electron devices, 63 (1), 459-464, 2016
- Ashish K. Agarwal, Rajesh Agarwal and B. mazhari Channel Pinch-Off Near Drain In Top Contact Organic Thin Film Transistor, IEEE Electron Device Lett., vol.36, no.9, pp.947-949, Sept. 2015
- 10. Ankita Gangwar and Baquer Mazhari, An Organic Device with Thin Film Transistor Merged with Light Emitting Diode through Use of an Accumulation Layer in TFT As an Electrode ECS Trans. 2015 67(1): 199-204
- 11. M. N. Islam and B. Mazhari, Organic Thin Film Transistors with Asymmetrically Placed Source and Drain Contact, IEEE Trans. Electron devices, 2014.
- 12. Rizvi, S. M. H. and Mantri, P. and Mazhari, B, Traps signature in steady state current-voltage characteristics of organic diode, Journal of Applied Physics, 115, 244502 (2014)
- 13. Prachi Mantri, S.M.H. Rizvi, B. Mazhari, Estimation of built-in voltage from steady-state current–voltage characteristics of organic diodes, Organic Electronics, Volume 14, Issue 3, August 2013, Pages 2034-2038.
- 14. Vinay Kumar Singh and Baquer Mazhari, Measurement of threshold voltage in organic thin film transistors, Appl. Phys. Lett. 102, 253304 , June 2013.
- 15. Arun Tej Mallajosyula, S. Sundar Kumar Iyer, Baquer Mazhari, Charge transport in polythiophene:fullerene:nanotube bulk heterojunction photovoltaic devices investigated by impedance spectroscopy, Current Applied Physics, June 2013
- 16. M. N. Islam and B. Mazhari, Organic Thin Film Transistors with Asymmetrically Placed Source and Drain Contact, Organic Electronics, Volume 14, Issue 3, March 2013, Pages 862-867.
- 17. Ashish K. Agarwal, and B. mazhari, Simultaneous Extraction of Source and Drain Resistances inTop Contact Organic Thin Film Transistors From a Single Test Structure, Organic Electronics: physics, materials, applications 13 (11), pp. 2659-2666, Nov. 2012.
- M. Narayanan, H. Al-Nashash, Baquer Mazhari, Dipankar Pal, and Mahesh Chandra Analysis of Kink Reduction in SOI MOSFET Using Selective Back Oxide Structure, Active and Passive Electronic Components, vol. 2012
- 19. <u>Mallajosyula, Arun Tej</u>, Iyer, S. Sundar Kumar; Mazhari Baquer, Capacitance–voltage characteristics of P3HT:PCBM bulk heterojunction solar cells with ohmic contacts and the impact of single walled carbon nanotubes on them, Org. Electronics, Volume 13, Issue 7, July 2012, Pages 1158–1165.
- 20. Vinay K. Singh, Baquer Mazhari, Impact of scaling of dielectric thickness on mobility in topcontact pentacene organic thin film transistors , J. Appl. Phys. **111**, 034905 , Feb 2012
- Vinay K. Singh, Ashish K. Agarwal and Baquer Mazhari, Measurement of Source Resistance in Top Contact Organic Thin Film Transistors, IEEE Electron Device Lett., EDL-9, March 2012

- 22. Vinay K. Singh, Baquer Mazhari, Accurate characterization of organic thin film transistors in the presence of gate leakage current, AIP ADVANCES 1, 042123 (2011)
- <u>Mallajosyula, Arun Tej</u>, Iyer, S. Sundar Kumar; Mazhari Baquer, Increasing the Efficiency of Charge Extraction Limited P3HT:PCBMSolar Cells Using SWNTs with Metallic Characteristics, Journal of Applied Physics, 109, 124908 (2011)
- 24. <u>Mallajosyula, Arun Tej</u>, Iyer, S. Sundar Kumar; Mazhari Baquer, Role of single walled carbon nanotubes in improving the efficiency of poly-(3-hexylthiophene) based organic solar cells, Journal of Applied Physics 108 (9), 2010.
- 25. A. Mallajosyula, N. Srivastava, S. S. K. Iyer and B. Mazhari, Characterization of matrix and isolated organic solar cells, Solar Energy Materials and Solar Cells, 94 (8), pp. 1319-1323.(2010)
- <u>Mallajosyula, Arun Tej</u>, Iyer, S. Sundar Kumar; Mazhari Baquer, A Comparative Study of Poly(3-octylthiophene) and Poly(3 hexylthiophene) Solar Cells blended with Single Walled Carbon Nanotube, Japanese Journal of Applied Physics, Volume 48, Issue 1, pp. 011503 (2009).
- M. N. Islam and B. Mazhari, Comparative Analysis of unity gain frequency of top and bottom-contact Organic thin film transistors, Solid State Electronics 53 (2009), pp. 1067-1075.
- 28. M. N. Islam and B. Mazhari, An analytical model for current crowding and source contact resistance in top-contact organic thin-film transistors, Semicond. Sci. Technol. ,vol. 23, issue 12, Dec. 2008, pp. 125027.
- 29. B. Mazhari, "An Improved Solar Cell Circuit Model For Organic Solar Cells," Solar Energy Materials and Solar Cells, Volume 90, Issues 7-8, 5 May 2006, pp. 1021-1033.
- 30. B. Mazhari, "Impact of Interfacial Barriers on Recombination Profile in Bilayer Organic Light-Emitting Diode," Organic electronics, 6 (2005), pp. 229-236.
- 31. B. Mazhari, "On the Estimation of Frequency Response in Amplifiers Using Miller's Theorem," IEEE Trans. Education vol. 48, no. 3, Aug. 2005, pp. 559-561.
- 32. B. Mazhari, 'Recombination efficiency in bilayer organic light-emitting diodes,' Solid State Electronics 49, March 2005, pp. 311-315.
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- 34. B. Mazhari, 'Amplifier Analysis: A Tradeoff perspective,' in IEEE Trans. on Education, vol. 48, no. 1, Feb. 2005, pp. 111-117.
- 35. R. S. Anand, B. Mazhari and J. Narain, 'Study of improved reverse recovery in power transistor incorporating universal contact,' Solid State Electronics 48 (2004) 655-667, May 2004.
- 36. R.S. Anand, B. Mazhari and J. Narain, A study into the applicability of p<sup>+</sup>n<sup>+</sup> (universal contact) to power semiconductor diodes for faster reverse recovery, Solid State Electronics 47 (1) (2003) pp. 83-91.
- 37. B. Mazhari and R. sharan, 'Photodetector-preamplifier for fiber optic systems,' IETE Journal of education, Vol. 38, 1997
- 38. B. Mazhari and H. Morkoc, 'Intrinsic gate delay of Si/SiGe integrated injection logic circuits,' Solid-State Electronics, 1995.
- 39. B. Mazhari and D.E. Ioannou, 'Surface Potential at threshold in thin film SOI MOSFETs,' IEEE Trans. Electron Devices, ED-40, 1993.
- 40. B. Mazhari and H. Morkoc, 'Surface recombination in GaAs PN junction diode,' Journal of Appl. Physics, 1993
- 41. B. Mazhari and H. Morkoc, 'Minority charge storage characteristics of HBT in saturation,' Solid-State Electronics, 1993.

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- 47. B. Mazhari, S. Cristoloveanu, D.E. Ioannou and A.L. Caviglia, 'Characteristics of Ultra-thin wafer bonded SOI MOSFETs,' IEEE Trans. Electron Devices, ED-38, 1991.
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- 53. R Agarwal, B. Mazhari, Characterization of Organic Semiconductor Insulator Interface using Asymmetric Capacitive Test Steucture, A-COE, 2017, Daejeon, Korea.
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- 55. Rizvi, S. M. H. and Mazhari, Detection of multiple trap distribution from steady state currentvoltage characteristics of organic diode, 2nd International Conference on Emerging Electronics: Materials to Devices (ICEE) 2014.
- 56. Rizvi, S. M. H. and Mazhari, Extraction of built-in potential from steady state characteristics, Organic Devices: The Future Ahead (ODeFA) 2014.
- 57. Ashish K. Agarwal, and B. mazhari, Estimation of Effective Source Length in Top Contact Organic Thin Film Transistors, IWPSD 2013.
- 58. A. Gangwar, B. Mazhari, Study of Polaron-pair Dissociation/Recombination at Organic-Organic Interface"; 9th International Conference on Organic Electronics ICOE 2013; June 17-20, 2013, MINATEC, Grenoble, France.
- 59. A. Gangwar, B. Mazhari ,"Effect of slow traps on capacitance-voltage measurement", IWPSD 2013.
- 60. Vinay K. Singh, Baquer Mazhari, Extraction Of linearly Extrapolated Threshold Voltage in Pentacene Organic Thin Film Transistors, IWPSD 2011, poster paper.
- 61. A. Gangwar, B. Mazhari, Analysis of Recombination Zone in Ambipolar Organic Light Emitting Transistors, IWPSD 2011
- 62. Arun Tej Mallajosyula, S. Sundar Kumar Iyer, and Baquer Mazhari, Enhanced performance of poly-3(hexylthiophene) single walled carbon nanotube bulk heterojunction solar cells using a poly-3(hexylthiophene) buffer layer and Ca electrode, 34th IEEE Photovoltaic Specialists Conference (PVSC), 2009

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- 66. M. N. Islam and B. Mazhari, Current distribution under source contact of top contact organic thin film Transistors, Proceedings of International Symposium on Flexible Electronics and Display (ISFED) 2008, Taiwan
- 67. M. N. Islam and B. Mazhari, Compraison of top and bottom contact organic thin film transistors for analog circuit applications, proceedings IEEE Conference on Electron Devices and Solid-State Circuits 2008.
- 68. Arun Tej Mallajosyula, S. Sundar Kumar Iyer, and Baquer Mazhari, Conduction properties of carbon nanotubes in Poly-(3-hexylthiophene) single walled Carbon Nanotube Bulk Heterojunction Solar Cells, 33<sup>rd</sup> IEEE photovoltaic specialists conference, May 2008
- 69. Arun Tej Mallajosyula, S. Sundar Kumar Iyer, and Baquer Mazhari, "Effect of Single Walled Carbon Nanotubes on the Performance of Poly-(3-hexylthiophene) Solar Cell", Proceedings of IEEE International nanoelectronics conference (INEC) ,2008.
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- Lava Kumar and B. Mazhari, "Optimum supply voltage for minimization of Leakage Currents through SRAM cell in stand-by mode," Proceedings 20<sup>th</sup> International Conference on VLSI Design, Jan. 6-10, 2007, Bangalore.
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- 73. D.K. Gupta and B. Mazhari, "Current Copying accuracy and Threshold Voltage Sensitivity in Current Driven Active Matrix Organic Light Emitting Display (AMOLED)," Proceedings of Asian Symposium on information display (ASID), Oct. 8-12, 2006, pp. 480.
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- R. Bisht and B. Mazhari, "Impact of Kink effect on performance of Poly-Silicon Based TFT Differential Amplifiers," Proceedings of Asian Symposium on information display (ASID), Oct. 8-12, 2006, pp. 407.
- B. Mazhari, M. Sinha and J. Dixit, 'Heterostructure PIN Rectifier Diode for power applications,' proceedings IEEE Conference on Electron Devices and Solid-State Circuits, Dec. 19-21, 2005, pp.807-810; Hong Kong
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- Ankur Goel and B. Mazhari, 'Proceedings of 18<sup>th</sup> International conference on VLSI design, Calcutta, 2005
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- 83. S. Biswas and B. Mazhari, "A path sensitization technique for testing of switched capacitor circuits," Proceedings of 16<sup>th</sup> International conference on VLSI design, Delhi, 2003
- 84. S.K. Bhowmik and B. Mazhari, "An improved four TFT circuit for Active-Matrix Organic Light Emitting Diode (OLED) Display", Digest of Society of Information Display(SID), Boston, 2002, pp.606.
- 85. B. Mazhari and S. Mehrotra, "Dynamic response time of Organic Light Emitting Diode (OLED) in Passive Matrix Displays," Digest of Asian Society of Information Display (ASID), Singapore, 2002, pp. 415.
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