

# SANDIP MAJUMDAR

Semiconductor/Nanotechnology Researcher | Reliability Engineer | Device Design Engineer |

## SUMMARY

10 years work experience (Post Ph. D)  
15 years experience in experimental semiconductor research and 4 years industry experience.

Hands on experience in Semiconductor Micro and Nano device process, design and characterization.

## PROFILE:

Name: SandipMajumdar  
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## SKILLS:

X-ray measurements  
Optical property measurement  
Transmission electron microscopy (TEM)  
Atomic force microscope (AFM)  
Scanning electron microscope (SEM)  
UV-vis spectrometer  
Photoluminescence measurement  
**Characterization system:**  
Electrical Measurement (Semiconductor parameter Analyzer  
Impedance Analyzer  
Magnetic Property Measurement System (MPMS)  
Physical Property Measurement System (PPMS)  
Low Temperature System (Cryostat)

**TCAD Simulation:** Semiconductor Process and Device simulation TCAD (SILVACO and Synopsys) tools.

## Sample preparation techniques:

Photo Lithography  
PECVD  
E-beam evaporation technique  
Pulsed Laser Deposition  
sputtering System  
Thermal Evaporation Technique  
Chemical process for semiconductor nanowire fabrication  
Molecular Beam Epitaxy (MBE)

## Device Characterization systems:

Agilent B1500A Semiconductor Device Analyzer  
Agilent 4156 A Semiconductor Parameter Analyzer  
Picoammeter: Keithley 6485 picoammeter  
Nanovoltmeter: Keithley 2182 nanovoltmeter  
Keithley SMU (2410, 2612 model)  
Keithley 4200 SCS  
LCR meter (HP 4285A)  
oscilloscope  
Signatone Probe station  
Low temperature measurement system (Lake shore)

## WORK EXPERIENCE:

**Assistant Professor (Physics)** Dec 2019-Till date  
Department of Science  
Serampore Girls' College, Hooghly, West Bengal.

**Principal Engineer** Dec 2018-Dec 2019  
Reliability Technology Department  
**Semiconductor Test Architect (STAR Technologies Inc). Taiwan R.O.C**

**Assistant Professor (Physics)** Feb 2016- Nov 2018  
Faculty of Science and Technology  
ICFAI University Tripura, Agartala , Tripura.

**Post Doctoral Researcher** Jan 2014- Jan 2016  
**The Key laboratory of Integrated Microsystems, Peking University,P.R China.**  
Research Topic: Carbon Nano tube/Organic thin film transistors on flexible substrates.

**Device Design Engineer** July 2010-Jan 2014  
Vishay Siliconix, (High Voltage MOSFET Research and Development Centre) India  
Research Topic: Design of High voltage Si power MOSFET's (super junction technology) and GaN power MOSFET design using TCAD tools

**Research Associate** May 2009-May 2010  
**School of Electronic Engineering, Chang Gung University, Taiwan**  
Research Topic: Fabrication of semiconductor (Silicon and Germanium) nanowires for flash memory and nanoelectronic devices.

## EDUCATION:

- **Ph. D** July 2005-Feb 2010  
**Area:** Semiconductor, Nanotechnology, Spintronics  
**Place:** Indian Institute of Technology (IIT) Kharagpur  
**Grade:** No grading for Ph. D students.  
**Thesis Title:** Growth and Characteristics of Manganese doped Germanium and Cobalt-Copper Granular Alloy for Spintronics Application
- **Master of Technology (M. Tech)** July 2003-July 2005  
**Area:** Materials Science and Technology (Specialization: Semiconductor Technology)  
Indian Institute of Technology, Kharagpur, India  
**Grade:** 8.27/10 scale  
**Thesis Title:** Study and Characterization of Gate Oxide Quality using Capacitance-Voltage Technique
- **Master of Science (M. Sc)** Sept 2001-June 2003  
**Area:** Physics  
**Division:** First Class  
**Thesis Title:** Study of an as prepared aluminum pellet by X-ray line broadening analysis,  
**Place:** Jadavpur University, Kolkata.
- **Bachelor of Science (B. Sc)** Aug 1998-Aug 2001  
**Subject:** Physics  
**Place:** University of North Bengal, India  
**Division:** First

## Scholastic Achievements

- 1. National Eligibility Test (NET) in Physics with CSIR-JRF Research Scholarship (2003).
- 2. Passed Graduate Aptitude Test in Engineering (GATE) (2003) in Physics.
- 3. CSIR research associate fellowship 2008-2009.
- 4. The Chinese Academy of Sciences (CAS), CAS Presidents International Fellowship

## Publication

International Journal: 13 (published)

International Conference: 6

Total Citation:243

h-index: 10

i-10 index: 10

### ○ **Reviewer:**

IEEE Transactions on Device and Materials Reliability

### ○ **Computer Skills:**

Operating System: Windows, Linux,  
Other Skill: C, C++, FORTRAN 77 And Matlab.

## Google Scholar

<https://scholar.google.com/citations?user=FvAnvSMAAAAJ&hl=en>

## LinkedIn

<https://www.linkedin.com/in/dr-sandip-majumdar-84736125/>

## Other Information

Date of birth: 13<sup>th</sup> Feb 1980

Marital Status: Married



## Research Project completed

**Visiting Researcher, Peking University, China,**

Jan 2014- Jan 2016

### **Carbon nanotube/Organic semiconductor thin film transistor on flexible substrates**

- Fabrication of organic semiconductor thin film transistors on flexible films. Integration of N-type and P-type materials.
- TCAD simulation of Organic TFT.
- Structural Characterization of organic thin film transistors.
- Study the transport and dielectric properties of Organic thin film transistors. Effects of gate dielectrics on the carrier mobility of OTFTs
- Investigation of Semiconductor/electrode interface in Organic Thin film transistors.

### **Device Design Engineer, Vishay Siliconix Inc.**

July 2010-Jan 2014

- Design of High voltage Si power MOSFET's (super junction technology) and GaN power MOSFET design using TCAD tools.
- Transient analysis and improvement of transient properties of High voltage MOSFETs. Transient properties like Inductive switching (clamped and unclamped), resistive switching, reverse recovery analysis studied.
- Supply designers with useful tools and information needed to appropriately deal with UIS (unclamped inductive switching) related issues in their circuits.
- Study and analysis of intrinsic capacitances, resistance, gate charge and the reverse recovery characteristics of the body diode, which plays a significant role in dynamic performance of the device.
- Worked as a key member of development Team for SJ mosfet (600 V and 1200 V).
- Calibration of all high voltage SJ MOSFET.
- Development and calibration of TCAD models.

### **Research Associate, Chang Gung University, Taiwan, May 2009-May 2010**

- Fabrication of Si and Ge nanowires.
- Study on resistive switching memory of Ge nanowires (NWs) [structure like IrOx/Al2O3/Ge NWs/SiO2/p-Si].
- Study of germanium nanowire nonvolatile memory based on a core shell structure.
- Optical and transport study of nanowire structures.
- Coreshell Ge nanowires for Photo detector devices.

### **Research Scholar (Ph.D), Indian Institute of Technology, Kharagpur, India June 2005-Feb 2010**

Thesis title: Growth and Characteristics of Manganese doped Germanium and Cobalt-Copper Granular Alloy for Spintronics Application.

#### **Thesis Supervisor: Prof. S.K Ray and Prof. A.K. Das**

- Optical, magnetic and structural properties of semiconductor nanostructures and thin films (Si and Ge), with an aim to improve the quality of the grown nanowires, films and their luminescence and magnetic properties.
- Fabrication of Ge nanowires using vapor-liquid-solid (VLS) technique, PLD deposition.
- Structural, Optical, Transport and Magnetic analysis of Nanowires.
- Fabrication of Magnetic Impurity doped nanowires.
- Fabrication of magnetic semiconductor thin film structures for Spintronics application.
- Used XRD, AFM, TEM, SEM to study the structural characterizations. To study the role of defects and material structure on the optical, magnetic and structural properties of the materials that lead to understanding the behaviour of the materials and optimizing the material/device structures. Also studied the optical properties.
- Used electrical characterization system and magnetic characterization systems for transport and magnetic properties study.

#### **Other Research Project:**

Study and Characterization of Gate Oxide Quality using Capacitance-Voltage Technique (M.Tech Project)- 6 months (M.Tech 3<sup>rd</sup>sem), Semiconductor Complex Limited, India

## PUBLICATIONS:

Name of the paper and Authors	citations	Year of publication
Design of RRAM with high storage capacity and high reliability for IoT applications J Wang, L Ji, J Bi, M Liu, K Xi, S Majumdar, S Mehmood Solid-State Electronics 194, 108292	1	2022
The influences of radiation effects on DC/RF performances of L g= 22 nm gate-all-around nanosheet field-effect transistor Y Ma, J Bi, S Majumdar, S Mehmood, L Ji, Y Sun, C Zhang, L Fan, B Zhao, ... Semiconductor Science and Technology 37 (3), 035010	1	2022
Simulations of single event effects on the ferroelectric capacitor-based non-volatile SRAM design J Wang, J Bi, G Liu, H Bai, K Xi, B Li, S Majumdar, L Ji, M Liu, Z Zhang Sci. China Inf. Sci 64, 1-3	3	2021
Numerical simulation of vertical tunnelling field-effect transistors charge-trapping memory with TCAD tools Y Cao, G Tian, M Sandip, J Bi, K Xi, B Li Semiconductor Science and Technology 36 (4), 045013		2021
Single-event-transient effects in silicon-on-insulator ferroelectric double-gate vertical tunneling field effect transistors G Tian, J Bi, G Xu, K Xi, X Yang, M Sandip, H Yin, Q Xu, W Wang Science China Information Sciences 63, 1-3	6	2020
Simulations of single event effects in 6T2C-based ferroelectric non-volatile static random access memory J Wang, J Bi, G Liu, H Bai, K Xi, B Li, L Ji, S Majumdar Semiconductor Science and Technology 36 (1), 015015	4	2020
Total ionization dose effects of N-type tunnel field effect transistor (TFET) with ultra-shallow pocket junction K Xi, J Bi, J Chu, G Xu, B Li, H Wang, M Liu, M Sandip Applied Physics A 126, 1-8	9	2020
Performance optimization of FD-SOI hall sensors via 3D TCAD simulations L Fan, J Bi, K Xi, S Majumdar, B Li Sensors 20 (10), 2751	4	2020
Cryogenic characterisation of 55 nm SONOS charge-trapping memory in AC and DC modes LJ Fan, JS Bi, YN Xu, K Xi, Y Ma, M Liu, S Majumdar Electronics Letters 56 (4), 199-201	7	2020
Tryst with uncertainty: Efforts of Department of Library and Information Science, University of Gour Banga, Malda, West Bengal, India S Majumdar Education for Information 36 (3), 327-331	1	2020
Total ionizing dose effects on graphene-based charge-trapping memory K Xi, J Bi, S Majumdar, B Li, J Liu, Y Xu, M Liu	3	2019

Science China Information Sciences 62, 1-8		
Study of $\gamma$ -ray radiation influence on SiO <sub>2</sub> /HfO <sub>2</sub> /Al <sub>2</sub> O <sub>3</sub> /HfO <sub>2</sub> /Al <sub>2</sub> O <sub>3</sub> memory capacitor by C–V and DLTS S Cao, X Ke, S Ming, D Wang, T Li, B Liu, Y Ma, Y Li, Z Yang, M Gong, ... Journal of Materials Science: Materials in Electronics 30, 11079-11085	8	2019
The total ionizing dose effects of X-ray irradiation on graphene/Si Schottky diodes with a HfO <sub>2</sub> insertion layer LL Yannan Xu, Yudong Li, Kai Xi, Linjie Fan, Ming Liu, Sandip Majumdar Microelectronics Reliability	3	2019
Study of $\gamma$ -ray radiation influence on SiO <sub>2</sub> /HfO <sub>2</sub> /Al <sub>2</sub> O <sub>3</sub> /HfO <sub>2</sub> /Al <sub>2</sub> O <sub>3</sub> memory capacitor by C–V and DLTS. X Ke, S Ming, D Wang, T Li, B Liu, S Cao, Y Ma, Y Li, Z Yang, M Gong, ... Journal of Materials Science: Materials in Electronics 30 (12)		2019
Temperature-dependent structure and magnetism of Mn-doped Ge nanowires S Majumdar, S Bhaumik, K Rana, SK Ray, AK Das physica status solidi (a) 211 (4), 877-883	5	2014
Resistive switching memory characteristics of Ge/GeO <sub>x</sub> nanowires and evidence of oxygen ion migration A Prakash, S Maikap, SZ Rahaman, S Majumdar, S Manna, SK Ray Nanoscale research letters 8, 1-10	48	2013
Investigation of strain in self-assembled multilayer InAs/GaAs quantum dot heterostructures S Adhikary, N Halder, S Chakrabarti, S Majumdar, SK Ray, M Herrera, ... Journal of crystal growth 312 (5), 724-729	83	2010
STRUCTURAL AND MAGNETIC FIELD DEPENDENT TRANSPORT PROPERTIES OF p-Mn <sub>x</sub> Ge <sub>1-x</sub> /n-Ge HETEROJUNCTION S Majumdar, AK Das, SK Ray International Journal of Modern Physics B 23 (17), 3579-3585		2009
Microstructure and magnetic properties of melt-spun Cu <sub>0.95</sub> Co <sub>0.05</sub> granular alloy S Majumdar, RK Singha, J Yoon, MH Jung, M Chakraborty, AK Das, ... Physica B: Condensed Matter 404 (12-13), 1858-1861	2	2009
Magnetic semiconducting diode of p-Ge <sub>1-x</sub> Mn <sub>x</sub> /n-Ge layers on silicon substrate S Majumdar, AK Das, SK Ray Applied Physics Letters 94 (12)	24	2009
Synthesis and temperature dependent photoluminescence properties of Mn doped Ge nanowires S Majumdar, S Mandal, AK Das, SK Ray Journal of Applied Physics 105 (2)	15	2009

<p>Shape and Size Distribution of Molecular Beam Epitaxy Grown Self-Assembled Ge Islands on Si (001) Substrates            RK Singha, S Das, K Das, S Majumdar, A Dhar, SK Ray            Journal of Nanoscience and Nanotechnology 8 (8), 4101-4105</p>	1	2008
<p>Temperature-dependent texture, stress and resistivity in melt spun Cu<sub>0.95</sub>Co<sub>0.05</sub> ribbon            S Majumdar, RK Singha, K Das, M Chakraborty, AK Das, SK Ray            Physica B: Condensed Matter 403 (12), 2059-2064</p>	1	2008
<p><a href="#">Evolution of strain and composition of Ge islands on Si (001) grown by molecular beam epitaxy during postgrowth annealing</a>            RK Singha, S Das, S Majumdar, K Das, A Dhar, SK Ray            Journal of Applied Physics 103 (11)</p>	28	2008

#### **INTERNATIONAL CONFERENCE PAPERS:**

- [1] Structural and Magnetic Field Dependent Transport Properties of  $Mn_xGe_{(1-x)}$  Dilute Magnetic Semiconductor Thin Films Grown by Laser Ablation Technique, SandipMajumdar, Amal Kumar Das, Samit Kumar Ray, IUMRS-ICEM 2008, Hilton Sydney, Australia. Page 96, Symposium R
- [2] Ge nanowires for nanoscale nonvolatile memory applications, S. Maikap , S. Majumdar, W. Banerjee, S. Mondal, S. Manna, and S. K. Ray, International conference on solid state devices and materials. Tokyo, Japan, 2010, pp-91-92
- [3] Microstructure and Electrical Properties of Cu-Co Magnetic Granular Ribbon: S. Majumdar, R. K. Singha, V. S. Reddy, K. Das, A. Dhar, M. Chakraborty, A. K. Das and S. K. Ray, ICRTNT (2006), Jadavpur University. Page 159
- [4] Field Dependent Transport Property of Magnetic Semiconducting  $p-Ge_{1-x}Mn_x/nGe$  Diode: S. Majumdar, A. K. Das and S. K. Ray, HomiBhaba Centenary DAEBRNS Natinal Conference on Spintronics and Magnetoelectronics Materials and Devices. Page 45
- [5] Temperature dependent optical and magnetic properties of Mn doped Ge nanowires, S. Majumdar, A. K. Das and S. K. Ray, Magnetic Nanomaterials and their applications (MNTA 2009), S. N Bose center for basic Sciences, Kolkata, Page 28.
- [6] Atomic Clusters and Compound Precipitates in Mn doped Ge Nanowires, Majumdar, S., Das, A. K., and Ray, S. K. (2009): 54thDAE Solid State Physics Symposium, Board of Research in Nuclear Sciences Department of Atomic Energy, Government of India, (Volume. 54, pp. 287-288)