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## SWAPNAJIT CHAKRAVARTY

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### OBJECTIVE:

Goal-oriented, self-motivated researcher/engineer seeking challenging R&D position applying knowledge in semiconductor device physics, hands-on cleanroom process development skills, expertise in electrical and optical device and material characterization to engineering advanced semiconductor materials and devices that expand the business of the company.

### EDUCATION:

**Doctor of Philosophy in Electrical Engineering** – April 2007

**University of Michigan**, Ann Arbor, MI (GPA 3.8 /4.0)

- Thesis: *"Two dimensional Photonic Crystal Slab Light Emitters, Light Emitting Arrays and Chemical Sensors"*
- Relevant Coursework: Applied Quantum Mechanics I & II, Semiconductor Lasers and LEDs, Properties of Transistors. Research involved knowledge of Classical and Non-linear Optics.

**Master of Science in Electrical Engineering** – Jun 2003

**University of Cincinnati**, Cincinnati, OH (GPA 4.0 /4.0)

- Thesis: *"Self-Organization and Aging in Network Glasses"*
- Relevant Coursework: Semiconductors and Heterojunctions, High Speed Electronic Devices, Device Modeling for VLSI, Optical Communications, Microwave Communications, Semiconductor Physics, Semiconductor Microfabrication (Si and III-V), Photonics Lab.

**Bachelor of Electrical Engineering** – Jul 2001

**Jadavpur University**, Calcutta, India (GPA 3.89 /4.0) First Class Honors

- Courses: Electrical Circuits, Power Systems Engineering, Electrical Machines, High Voltage Engineering, Electronics, Control Systems, Optical Physics.

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### SCIENTIFIC AND TECHNICAL AREAS OF EXPERTISE:

#### **Device Design:**

- Sentaurus Device Modeling, Numerical Programming in Matlab, Mathematica, C.
- Finite difference time domain (FDTD) and plane wave expansion (PWE) simulations with RSoft's Fullwave and BandSolve to model III-V Fabry-Perot and photonic crystal lasers.

#### **Device Fabrication:**

- Three years clean room processing experience at Michigan Nanofabrication Facility.
- Electron-beam lithography, Photolithography, Step-And-Scan Lithography, Mask Making.
- Dry Etching using Reactive Ion Etching (RIE), Inductively Coupled Plasma- RIE.
- Electron Cyclotron Resonance-RIE, Deep silicon etching.
- PECVD, Thin Film Deposition, Rapid Thermal Annealing, Wire bonding.
- Metrology Tools, Wet Chemical Etching of III-V compounds, silicon dioxide, silicon nitride.
- Chemical and Mechanical wafer polishing, Inking of polymers with PDMS molds.
- Professional development courses in NanoCMOS logic and memory device physics and fabrication and associated reticle inspection challenges, optical lithography (SPIE).
- Die-die, die-database and starlight reticle inspection with KLA-Tencor 5xx and SLF systems.

#### **Material and Device Characterization:**

- Scanning Electron Microscopy, Optical Infrared Spectroscopy, Photoluminescence.
- Micro photoluminescence, Electroluminescence, light-current (L-I), I-V and reliability measurements of III-V Fabry-Perot lasers and photonic crystal lasers.
- Raman Spectroscopy, FTIR, X-ray Diffraction, Temperature modulated DSC.
- Photonics test and measurement with OSA, lasers, detectors, lenses, filters, power meters.
- Familiar with biotin-streptavidin conjugates in biophotonics, ionophores as chemical sensors.

- Measurement of optical waveguides and familiarity with color-center and Nd:YAG lasers.

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### **RELEVANT EXPERIENCE / SIGNIFICANT ACHIEVEMENTS:**

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**KLA-Tencor**, San Jose, CA Feb 2007– Present

**Applications Development Engineer** (Reticle and Photomask Inspection Division).

- Developing new standards for reticle and photomask inspection.
- Develop plans and projects for new technology incubation and R&D initiatives.
- Research and analyze emerging technologies and new trends in nanolithography and identify technology opportunities and challenges for KLA-Tencor reticle inspection tools.

**University of Michigan**, Ann Arbor, MI Sep2006 – Dec. 2006

**Graduate Student Instructor** – Properties of Transistors (dual level course)

- Responsibilities: Leading hour-long weekly discussion section, holding office hours and preparing homework solutions, led class during lectures and proctored midterm exams.

**University of Michigan**, Ann Arbor, MI Jul 2003 – Aug. 2006

**Graduate Student Research Assistant**

- Engaged with the design, modeling, fabrication and characterization of microcavity optoelectronic devices for integrated optics and nanophotonics.
- Demonstrated a top-emitting photonic crystal microcavity light emitter with direct microcavity contact by metallic air-bridge fabricated by single-step e-beam lithography.
- Fabricated an electrically injected photonic crystal microcavity light emitting array with air bridge nano-contacts.
- Manifested multiwavelength lasing in optically excited photonic crystal microcavities.
- Implemented an active photonic crystal microcavity ion-sensing device.
- Demonstrated a bottom emitting electrically injected photonic crystal light emitter.
- Participated in writing proposals for research and equipment grants, project reviews.
- Coordinated proposal writing, purchase and setting up of equipment worth \$250,000 for measurement of electrically driven photonic crystal single photon sources such as Ti:sapphire laser, femtosecond OPAL laser, PMTs, spectrometers and other optical accessories.
- Mentored research of new graduate and undergraduate students.

**University of Cincinnati**, Cincinnati, OH Aug 2001 – Jun 2003

**Graduate Research Assistant**

- Researched self-organization and aging effects in ternary P<sub>x</sub>G<sub>e</sub>xSe<sub>1-2x</sub> glasses by temperature modulated differential scanning calorimetry and molar volume measurements.
- Performed spectroscopic analysis of covalent structure of chalcogenide glasses using Raman spectroscopy and Fourier Transform Infrared Spectroscopy (FTIR).
- Performed X-Ray diffraction analysis of glassy nature of melt-quenched chalcogenide glasses.
- Mentored research of new graduate and undergraduate students.

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### **AWARDS & HONORS:**

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- EECS Department Fellowship, University of Michigan, Ann Arbor, MI (Sep 2003 – Apr 2007).
- First Prize at the Raith Micrograph Award Competition 2006.
- Third Prize at the college wide Engineering Graduate Student Symposium 2006 at the University of Michigan in Electronic Materials and Devices.
- University Graduate Stipend, University of Cincinnati, OH (Sep 2001 – Jun 2003).
- First class distinction with Honors in Bachelor of Electrical Engineering (2001).
- Sandeep Tandon Memorial Award for top ranking student in EE Department, Jadavpur University, Calcutta, India (1998, 1999, 2000).
- Bepin Behari & Malatimala Rakshit Memorial Bronze Medal (2001) for overall second rank in undergraduate Electrical Engineering, Jadavpur University, Calcutta, India.
- Ranked in the top 0.1% in the statewide Engineering Entrance Examinations (1997).
- Ranked 13<sup>th</sup> amongst approximately 100,000 students in the West Bengal Board of Secondary Education examinations (1995).

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**PUBLICATIONS:**

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**Selected Archival Journal Articles:**

- **S. Chakravarty**, P. Bhattacharya, S. Chakrabarti and Z. Mi, "Multiwavelength ultra-low threshold lasing in quantum dot photonic crystal microcavities," *Opt. Lett.* 32, 1296 (2007), also selected in the *Virtual J. Nanoscale Science and Tech.* (Vol. 15, Issue 17, 2007).
- **S.Chakravarty**, P.Bhattacharya, Z.Mi, "Electrically injected quantum-dot photonic crystal microcavity light emitting arrays with air-bridge contacts," *IEEE PTL*, 18, 2665 (2006).
- **S.Chakravarty**, P.Bhattacharya, J.Topolčančik, "Electrically-injected quantum-dot photonic-crystal microcavity light-emitters and microcavity arrays," *J. Phys. D* 40, 2683 (2007).
- P. Boolchand, M. Jin, D. Novita, and **S. Chakravarty**, "Raman scattering as a probe of intermediate phases in glassy networks," *Journal of Raman Spectroscopy* (accepted).
- J.Topolčančik, **S.Chakravarty**, P.Bhattacharya, S.Chakrabarti, "Electrically injected quantum-dot photonic crystal microcavity light sources," *Opt. Lett.*31, 232 (2006), also selected in the *Virtual J. Nanoscale Science and Tech.* (Vol. 13, Issue 6, 2006)
- P. Bhattacharya, J. Sabarinathan, J. Topolčančik, **S. Chakravarty**, P.C. Yu, and W. Zhou, "Quantum dot photonic crystal light sources," *Proc. of the IEEE* 93 (10), 1825-1838 (2005).
- **S.Chakravarty**, J.Topolčančik, P.Bhattacharya, S.Chakrabarti, Y. Kang, M.E. Meyerhoff, "Ion detection with photonic crystal microcavities," *Opt. Lett.* 30, 2578 (2005).
- **S.Chakravarty**, D.G.Georgiev, P.Bootchand, M.Micoulaut, "Aging, fragility and the reversibility window in bulk alloy glasses," *J. Phys.-Cond. Matt.* 17(1), L1-L7 (2005).
- P. Boolchand, D.G. Georgiev, T. Qu, F. Wang, L. Cai, and **S. Chakravarty**, "Nano-scale phase separation effects near  $r = 2.4$  and  $2.67$ , and rigidity transitions in chalcogenide glasses," *Comptes Rendus Chimie* 5 (11), 713-724 (2002).

**Selected Conference Papers and Presentations:**

- J-P. Sier, E.H. Lu, K. Bhattacharyya, **S. Chakravarty**, M. Lang, H. Schmalfluss, J. Heumann, T. Schulmeyer, "Enhancing productivity and sensitivity in mask production via a fast integrated T+R pattern inspection and STARlight-2™ contamination inspection on critical layers," Poster Presentation, SPIE Photomask Japan, April 17-19 (2007), Yokohama, Japan.
- **S. Chakravarty**, P.Bhattacharya, Z.Mi, "Electrically injected quantum dot photonic crystal microcavity light emitting arrays with air-bridge nano-contacts," *Oral Presentation* IEEE LEOS, Oct 29-Nov 2 (2006), Montreal, Quebec, Canada.
- **S. Chakravarty**, Z. Wu, and P. Bhattacharya, "Electrically injected quantum dot photonic crystal microcavity light emitters and microcavity arrays," *Oral Presentation* at 2006 Engineering Graduate Student Symposium, University of Michigan Ann Arbor.
- **S.Chakravarty**, Y.Kang, J.Topolčančik, P.Bhattacharya, M.E.Meyerhoff, S.Chakrabarti, "Photonic crystal microcavity source based ion sensor," *Oral Presentation* 4th IEEE Conference on Sensors, Oct 31-Nov 3 (2005), Irvine, CA.
- **S.Chakravarty**, Y.Kang, J.Topolčančik, P.Bhattacharya, M.E.Meyerhoff, S.Chakrabarti, "Photonic crystal microcavity source based chemical sensor," *Proceedings of SPIE* 600504 (2005). *Oral Presentation* Optics East Oct 22-26 (2005), Boston, MA.
- **S.Chakravarty**, J.Topolčančik, P.Bhattacharya, S.Chakrabarti, "Electrically injected quantum-dot bottom emitting photonic crystal single mode microcavity light source," *Oral Presentation* Device Research Conference, Jun 21-23 (2005), Santa Barbara, CA.
- P. Chen, **S. Chakravarty**, P. Boolchand, and M. Micoulaut, "Aging, reversibility window and fragility in  $\text{Ge}_x\text{P}_x\text{Se}_{1-2x}$  bulk alloy glasses," Annual APS March Meeting, March 22-26 (2004), Montreal, Quebec, Canada
- **S.Chakravarty**, D.G.Georgiev, P.Bootchand, M.Micoulaut, "Self-Organization in  $\text{PxGe}_x\text{Se}_{1-2x}$  glasses," *Oral Presentation* APS March Meeting, Mar 3-7 (2003), Austin, TX.
- **S.Chakravarty**, D.G.Georgiev, P.Bootchand, "Thermally reversing window in  $\text{PxGe}_x\text{Se}_{1-2x}$  glasses," *Oral Presentation* APS March Meeting, Mar 18-22 (2002), Indianapolis, IN.

**Professional Society Memberships:** IEEE Member (2005-), Student member of the American Physical Society (2001-2003), Member SPIE (2007-)