

Name of the Faculty member: Dr.Sunanda Dhar

Designation : Professor

Specialization : Group III-V semiconductors epitaxial growth and characterization, Optoelectronics and Fiber Optics

Research interests : Group III-V compound Semiconductor epitaxial growth and Characterization

Research guidance:

Number of researchers awarded Ph. D degree : 11

Number of researchers submitted Ph. D thesis : 1

Number of researchers pursuing Ph. D work: 4

**Ongoing Projects:**

`Design and development of crystal growth system for preparation of high pure gallium nitride for light emitting diode (LED) and other related optoelectronic applications`  ( in collaboration with Centre for Materials for Electronic Technology, Hyderabad)	DST	Rs.72,69,600/-	Co-Principal Investigator
---	-----	----------------	---------------------------

Selected list of publications (since 2000):

a) Journals:

1.. `Calculation of Valence Band Structure and Band Dispersion in Indium containing III-V Bismides by k-p method`, D. P. Samajdar and S. Dhar, Computational Materials Science, **111**, 497 (2016), Impact factor: 2.1

2. `Influence of Bi-related impurity states on the Bandgap and Spin-orbit Splitting Energy of dilute III-V-Bi Alloys: InP1-xBix, InAs1-xBix, InSb1-xBix and GaSb1-xBix`, D. P. Samajdar and S. Dhar, Superlattices and Microstructures, **89** 112 (2016) , IF: 2.1

3. `Estimation of Bi induced changes in the direct EO band gap of III-V-Bi alloys and comparison with experimental data`, D. P. Samajdar and S. Dhar, *Physica B: Condensed Matter*, **484** 27 (2016), IF: 1.3
  4. `Investigation of the below band gap infrared absorption properties of GaSbBi epitaxial layers grown on GaSb` D. P. Samajdar, M. K. Bhowal, T. D. Das, and S. Dhar, *J. Materials Science: Materials in Electronics* (2016), IF: 1.569
  5. `Valence band anticrossing model for for GaSb<sub>1-x</sub>Bi<sub>x</sub> and GaP<sub>1-x</sub>Bi<sub>x</sub> using k.p method` D. P. Samajdar, T. D. Das and S. Dhar, *Materials Science in Semiconductor Processing*, **40**, 539–542 (2015), IF: 1.955
  6. `Dependence of heavy hole exciton binding energy and the Strain distribution in GaAs<sub>1-x</sub>Bi<sub>x</sub>/GaAs Finite Spherical Quantum Dots on Bicontent in the material`, Subhasis Das, Akant Sagar Sharma, T. D. Das and S. Dhar, *Superlattices and Microstructures* [86](#), 221–227 (2015), IF: 2.1
  7. `Optical density of states in ultradilute GaAsN alloy: Coexistence of free excitons and impurity band of localized and delocalized states` Sumi Bhuyan, Sanat K. Das, Sunanda Dhar, Bipul Pal, and Bhavtosh Bansal, *Journal of Applied Physics* **116**, 023103 (2014) IF:2.18
  8. `Effect of post growth anneal on the photoluminescence properties of GaSbBi`, S. K. Das, T. D. Das, and S. Dhar, *Semiconductor Science and Technology* **29**, 015003 (2014). IF: 2.19
  9. *Transport of bismuth atoms during liquid phase epitaxial growth of InSbBi and GaSbBi`*, D. P. Samajdar and S. Dhar, *Semiconductor Science and Technology*, **28**, 065007 (2013)
  10. . `Infrared absorption and Raman spectroscopy studies of InSbBi layers grown by liquid phase epitaxy` S.C. Das, T.D. Das, S. Dhar, *Infrared Physics & Technology* **55**, 306–308(2012)
  11. `Near infrared photoluminescence observed in dilute GaSbBi alloys grown by liquid phase epitaxy` S. K. Das, T. D. Das and S. Dhar, M. de la Mare and A. Krier, *Infrared Physics and Technology (UK)* , **55** 156–160 (2012)
  12. . `Properties of GaAsN layers grown from melt containing Li<sub>3</sub>N as flux for enhancing nitrogen dissolution`, S. K. Das, T. D. Das and S. Dhar, *Semiconductor Science and Technology*, **26**, 085028 (2011)
  13. `N-incorporation and photoluminescence in In-rich InGaAsN grown on InAs by liquid phase epitaxy` M. de la Mare, S. C. Das, T. D. Das, S. Dhar, and A. Krier, *Journal of Physics D: Appl. Phys.* **44**, 315102 (2011) , IF: 2.721
  14. `Growth and characterization of InAsN/GaAs dilute nitride semiconductor alloys for the mid-infrared spectral range` M, de la Mare, Q. Zhuang, A. Krier, A. Patane and S. Dhar, *Applied Physics Letters* **95**, 031110 (2009)
  15. `Properties of dilute InAsN layers grown by liquid phase epitaxy` S. Dhar, T. D. Das, M. de la Mare, and A. Krier, *Applied Physics Letters* **93**. 07195 (2008) Impact factor: 3.3
  16. `Characterization of dilute InPN layers grown by liquid phase epitaxy` T. D. Das, S. Dhar and B. M. Arora, *Journal of Applied Physics* **104**, 103715 (2008) IF:2.18
  17. `Detailed studies on the origin of nitrogen-related electron traps in dilute GaAsN layers grown by liquid Phase epitaxy` S. Dhar, N. Halder and A. Mondal, *Semiconductor Science and Technology* **20**, 168 (2005)
  18. `Observation of a 0.7 eV electron trap in dilute GaAsN layers grown by liquid phase epitaxy` S. Dhar, N. Halder, J. Kumar and B. M. Arora, *Appl. Phys. Lett.* **85**, 964 (2004)
-

19. *Atomic layer predeposition for GaAs growth on Si* U. Das, S. Dhar and M. Mazumdar, Appl. Phys. Lett. **68**, 3573 (1996)
  20. *Impurity reduction in InGaAs layers grown by liquid phase epitaxy using Er-treated melts* S. Dhar, S. Paul And V. N. Kulkarni, Appl. Phys. Lett. **76**, 1588 (2000)
- 

b) Book chapters:

1. *Deep levels in III-V compound semiconductors grown by molecular beam epitaxy* P. K. Bhattacharya and **S. Dhar**, in *Semiconductors and Semimetals* (eds: Willardson and A. C. Beer), Vol. **26**, pp 143-228, Academic Press, New York (1988)
2. *Group III-V bismide materials grown by liquid phase epitaxy*, S. Dhar, in *Bismuth-Containing Compounds* Chapter 6, Wang, Zhiming M. and Wu, Jiang (Eds.), [Springer Series in Materials Science](#), Vol. 186 (2013)

Membership of Learned Societies:

Member, Semiconductor Society of India and Member, Materials Research Society of Singapore

Invited talks delivered:

1. *Defects in compound semiconductors*, Presented at IIT Kharagpur, India (1990)
2. *Etching of semiconductors*, Presented at IIT Kharagpur, India (1990)
3. *The technology of III-V compound semiconductor materials*, Presented at the SEERC School on Materials for Advanced Research and Technology, Anna University, Chennai (1997)
4. *Characterization of deep levels in semiconductors*, Presented at the SEERC School on Materials for Advanced Research and Technology, Anna University, Chennai (1997)
5. *Growth of high purity epitaxial layers by liquid phase epitaxy*, Presented at the SEERC School on Materials for Advanced Research and Technology, Anna University, Chennai (1997)
6. *Porous Si materials and devices*, Presented at the QIP Winter School on *Silicon as Optoelectronic Material*, IIT Kharagpur (1997)
7. *Erbium doped ternary III-V semiconductor layers grown by liquid phase epitaxy*, Presented at the 8<sup>th</sup> National Seminar on Crystal Growth, Chennai (1999)
8. *Technology of compound semiconductors*, Presented at the Symposium on *Frontiers of Electronics*, Calcutta (1999)
9. *Porous silicon nanostructures*, Presented at the Indo-French workshop on *Quantum Semiconductor Structures : Modern Developments*, Calcutta (1999)

10. *'Rare-earth treated melt growth of III-V semiconductor layers: purification and other issues'*, Presented at the VI<sup>th</sup> International Conference on 'Optoelectronics, Fiber optics and photonics', TIFR, Mumbai, India (2002)
11. *'Isoelectronic doping of compound semiconductors'*, Presented at the Conference on 'Horizons of Telecommunications', Calcutta, India (2003)
12. *'Growth and characterization of InGaP layers and heterostructures'*, Presented at the 9<sup>th</sup> National Conference on Crystal Growth, Chennai, India (2003)
13. *'Rare-earth and transition metal doped InGaP; Growth and characterization'*, Presented at the International Conference on 'Communication, Devices and Intelligent Systems', Calcutta (2004)
14. *'Liquid phase epitaxial growth and characterization of dilute III-V nitrides'*, Presented at the International Conference on 'Optoelectronic Technology', Jalgaon, India (2004)
15. *'Growth of high purity semiconductor epitaxial layers by liquid phase epitaxy and their characterization'*, Presented at the International Symposium on 'Ultrapure materials, processing, characterization and applications', Hyderabad, India ( Nov 2004)
16. *'Nitrogen-related deep levels in dilute III-V nitrides grown by liquid phase epitaxy'*, Presented at the 7<sup>th</sup> International Conference on 'Optoelectronics, fiber optics and photonics', Cochin, India (Dec 2004)
17. *'Progress in the technology of compound semiconductors'*, Presented at the National Seminar on 'The Impact of Condensed Matter Physics on Technology- Some Recent Trends', SMIT, Sikkim (2005)
18. *'Dilute III-V-nitrides: A material for future nano-devices'*, Presented at the International Conference on MEMS and Semiconductor Nanotechnology, IIT Kharagpur, India, December 2005
19. *'Compound semiconductors'*, Presented at the 8<sup>th</sup> Chitagong Conference on Mathematical and Physical Sciences, Chitagong, Bangladesh (2005)
20. *'Growth, Structural and Electrical Properties of III-V dilute nitrides'*, Presented at the International Workshop on Crystal Growth and Characterisation of Advanced Materials, Chennai, India, January, 2006
21. *'Investigation of some group III-V dilute nitride materials grown by liquid phase epitaxy'*, presented at the International Workshop on the 'Physics of Semiconductor Devices', Mumbai, Dec 2007
22. *'Novel LPE technique for the growth of dilute III-V-nitride materials'*, Presented at the National Workshop on 'Advanced Optoelectronic Materials and Devices', Varanasi, India, Dec 2007.
23. *'Growth of Group III-V Epitaxial Semiconductors by Liquid Phase Epitaxy'*, S. Dhar, Presented at the 'Bose Conference on Contemporary Physics-08', University of Dhaka, Dhaka, Bangladesh (2008)
24. *'Application of liquid phase epitaxy technique for the growth of dilute III-V-nitride materials'*  
*Presented at TIFR, Mumbai, May 2008*
25. *'Growth of dilute nitrides by liquid phase epitaxy'* Presented at Physics Department, Lancaster University, UK (2008)
26. *'LPE growth of high purity and novel III-V semiconductors'* Presented at the IIT Bombay, Mumbai (2010)

27. `*Tools for compound semiconductor nanostructure growth*` , Presented at the Centre for Research in Nanoscience and Nanotechnology, Calcutta University, February, 2010.
28. `*III-V-bismides, a new material for infra-red optoelectronics*` , Presented at the Department of Applied Physics, Electronics and Communication Engineering, University of Dhaka, Dhaka, Bangladesh, May 2010
30. `*Growth and characterization of the ternary bismide alloy GaSbBi*` Presented at the Asia-Pacific Workshop on Characterization of Semiconductors, Anna University, Chennai, Sept 2011
31. `*Melt growth of GaAs<sub>1-x</sub>N<sub>x</sub> (x ≤ 0.01) epitaxial layers for photoconductive devices*` , S. K. Das, S. Dhar, and A. Bhattacharya, Presented at the International Workshop on Physics of Semiconductor Devices, IIT Kanpur, India, Dec 2011
32. `*Advances in the technology of compound semiconductors*` , S. Dhar, Presented at the Workshop on “*Current trends in Electronic Materials & Devices*”, Manipal University, Jaipur, March 2012
34. `*Compound semiconductors for modern optoelectronic devices*` , Presented at National Institute of Technology, Agartala, November 2013
35. `*Compound semiconductors for modern optoelectronic devices*` , Presented at National Institute of Technology, Silchar, November 2013
36. `*Epitaxy of semiconductors*` , Presented at Gauhati University, October 30, 2014
37. `*Role of semiconductors in the present era*` , Presented at the IEEE National Conference on Electrical, Electronics and Computer Engineering, Kolkata, Nov 7,8, 2014
38. `*Characterization of deep levels in semiconductors*` , presented at the Short Term Course on ‘*Experimental techniques for materials characterization*’ , NIT Durgapur, Feb 27 to March 3, 2015
39. `*Semiconductor epitaxial growth and characterization*` , presented at the International Conference on Electrical Engineering & Information & Communication Technology, Jahangirnagar University, Dhaka, Bangladesh, May 21-23, 2015
40. `*Semiconductor Technology in the Present Era*` , Presented at the Institute of Energy, University of Dhaka, Bangladesh, May 25, 2015.
41. `*Materials for optoelectronic devices, Growth of bulk crystals and epitaxial layers*` , S. Dhar, presented at the workshop on “*Current Trends in Photonic Devices: Physics, characterization and Realization with MATLAB*” , WB University of Technology, July 2015
42. `*Materials for optoelectronic devices, characterization of bulk crystals and epitaxial layers*` , S. Dhar, presented at the workshop on “*Current Trends in Photonic Devices: Physics, characterization and Realization with MATLAB*” , WB University of Technology, July 2015
43. `*Recent trends in semiconductor nanotechnology*` , Presented at the 1<sup>st</sup> International Conference on Electrical and Electronic Engineering` , Rajshahi University of Engineering and Technology, Rajshahi, Bangladesh (2015)

15. Awards: *UGC Career Award, 1990*

16. Other notable activities:

- Acted as the Chairman, Board of UG Studies in Electronics, Calcutta University during 2004-2008.

- Former member, Board of Studies, A. P. C. College and Andrews College, Kolkata
- Member, Board of Studies of R. K. Mission College and ISM University Dhanbad
- Member, Board of Professional Studies in Nanotechnology, North Eastern Hill University, Shillong
- Member, School Board of Technology, North Eastern Hill University, Shillong
- Member of the Board of Governors of National Institute of Technology, Silchar (2009-15)
- Member of the Senate, National Institute of Technology, Silchar.
- Acted as the member of the specialist group on `Green photonics` of the Department of Information Technology, Government of India.
- Member, Standing Review Committee, ISRO-IIT Bombay project
- Acted as an overseas expert for National Research Foundation, South Africa
- Actively associated with the Centre for Research in Nanoscience and Nanotechnology of the University from the planning stage to the purchase of equipments for nanoelectronics research.