

Sarit Dhar, Ph.D.

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EDUCATION:

- **Vanderbilt University**, Nashville, TN May 2005
Doctor of Philosophy in Interdisciplinary Materials Science
- **Indian Institute of Technology**, Kharagpur, India June 2000
Master of Science in Physics
- **Indian Institute of Technology**, Kharagpur, India June 1998
Bachelor of Science in Physics

RESEARCH INTERESTS:

- Wide-band gap semiconductor materials science and technology
- Silicon carbide and Gallium Nitride power electronics
- Dielectric-semiconductor materials systems and MOS device physics
- Semiconductor interfaces, Nano-scale interface modification, Interfacial chemistry-electronic property correlations
- Micro and nano-electronic device processing and characterization

PROFESSIONAL EXPERIENCE:

- **Assistant Professor** January 2012- Present
Department of Physics, Auburn University, AL
- **Research Scientist** January 2008 – January 2012
Power Electronics R&D, Cree Inc., Durham, NC
- **Research Associate** March 2005 – January 2008
Department of Physics and Astronomy, Vanderbilt University, Nashville, TN
- **Graduate Research Assistant** June 2001 – February 2005
Interdisciplinary Program in Materials Science, Vanderbilt University, Nashville, TN
- **Graduate Teaching Assistant** September 2000 – May 2001
Interdisciplinary Program in Materials Science, Vanderbilt University, Nashville, TN

MISC. PROFESSIONAL ACTIVITIES:

- Reviewer for: Journal of Applied Physics, Applied Physics Letters, Journal of Physics D: Applied Physics, Semiconductor Science and Technology, Nanotechnology and IEEE Electron Device Letters
- Member of Materials Research Society

PATENTS:

- Inventor or co-inventor in 6 patent applications (pending) related to SiC MOSFET technology
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JOURNAL PUBLICATIONS:

- **S. Dhar**, A.C. Ahyi, J. R. Williams, S.-H. Ryu and A.K. Agarwal, “Temperature dependence of inversion layer carrier concentration and Hall mobility in 4H-SiC MOSFET”, accepted for publication, Materials Science Forum (2012)
- C. X. Zhang, E. X. Zhang, D. M. Fleetwood, R. D. Shrimpf, **S. Dhar**, S.-H. Ryu, X. Shen and S. T. Pantelides, “Effect of bias on irradiation and annealing responses of 4H-SiC MOS devices”, accepted for publication, IEEE transactions on Nuclear Science (2012)
- A. Basile, **S. Dhar** and P.M. Mooney, “Electron trapping in 4H-SiC MOS capacitors fabricated by pre-oxidation nitrogen implantation”, Journal of Applied Physics, 109, 114505 (2011)
- B. R. Tuttle, **S. Dhar**, S.-H. Ryu, X. Zhu, J. R. Williams, L. C. Feldman and S. T. Pantelides, “High electron mobility due to sodium ions in the gate oxide of SiC metal-oxide-semiconductor field effect transistors”, Journal of Applied Physics, 109, 023702 (2011)
- S. L. Rumyantsev, M. S. Shur, M. E. Levinstein, P. A. Ivanov, J. W. Palmour, A. K. Agarwal and **S. Dhar**, “Si-like low frequency noise characteristics of 4H-SiC MOSFETs”, Semiconductor Science and Technology, 26, 085015 (2011)
- X. Shen, E. X. Zhang, C. X. Zhang, D. M. Fleetwood, R. D. Shrimpf, **S. Dhar**, S.-H. Ryu and S.T. Pantelides, “Atomic scale origin of bias-temperature instabilities in SiO₂-SiC structures”, Applied Physics Letters, 98, 063507 (2011)
- **S. Dhar**, S. Haney, L. Cheng, S.-H. Ryu, A. K. Agarwal, L. C. Yu and K. P. Cheung, “Inversion layer carrier concentration and mobility in 4H-SiC metal-oxide-semiconductor field effect transistors”, Journal of Applied Physics, 108, 054509 (2010)
- **S. Dhar**, S.-H. Ryu and A. K. Agarwal, “A study on pre-oxidation N implantation for the improvement of channel mobility in 4H-SiC MOSFETs”, IEEE Transactions on Electron. Devices, 57, 1195 (2010)
- **S. Dhar**, O. Seitz, M. D. Hall, S. Choi, Y.J. Chabal and L. C. Feldman “Chemical properties of oxidized silicon carbide surfaces upon etching in hydrofluoric acid” J. American Chemical Society, 127, 16808 (2005)
- J. Rozen, **S. Dhar**, M. E. Zvanut, J. R. Williams and L. C. Feldman. “Density of interface states, electron traps, and hole traps, as a function of the nitrogen density in SiO₂ on SiC” Journal of Applied Physics, 105, 124506, (2009)
- D. Lichtenwalner, V. Misra, **S. Dhar**, S.-H. Ryu and A. K. Agarwal, “High-mobility enhancement-mode 4H-SiC lateral field-effect transistors utilizing atomic layer deposited Al₂O₃ gate dielectric”, Applied Physics Letters, 95, 152113 (2009)
- **S. Dhar**, X.D. Chen, P. M. Mooney, J. R. Williams and L. C. Feldman, “Profiling ultra-shallow interface states at the SiO₂/4H-SiC interface”, Applied Physics Letters, 92, 102112 (2008)
- J. Rozen, **S. Dhar**, S. K. Dixit, V. V. Afanas’ev, F. O. Roberts, H. L. Dang, S. Wang, S. T. Pantelides, J. R. Williams and L. C. Feldman, “Increase in hole trap density associated with nitrogen incorporation at the SiO₂/SiC interface” Journal of Applied Physics, 103, 124513 (2008)
- X.D. Chen, **S. Dhar**, T. Isaacs-Smith, J. R. Williams, L. C. Feldman, and P. M. Mooney, “Electron capture and emission properties of interfaces states in thermally oxidized and NO annealed SiO₂/4H-SiC”, Journal of Applied Physics, 103, 033701 (2008)

- E. Ray, J. Rozen, **S. Dhar**, L. C. Feldman and J. R. Williams, “ Pressure dependence of SiO₂ growth kinetics and electrical properties of SiC’ Journal of Applied Physics, 103, 023522 (2008)
- J. Rozen, **S. Dhar**, S. T. Pantelides, L. C. Feldman, S. Wang, J. R. Williams and V. V. Afanas’ev, “Suppression of interface state generation upon electron injection in nitrided oxides grown on 4H-SiC”, Applied Physics Letters, 91, 153503 (2007)
- S. Wang, **S. Dhar**, S. Wang, A. C. Ahyi, A. Franceschetti, J. R. Williams, L. C. Feldman and S. T. Pantelides, “Bonding at the SiO₂/SiC interface and the effects of nitrogen and hydrogen”, Physical Review Letters, 98, 026101 (2007)
- **S.Dhar**, R. P. Davis and L. C. Feldman, “A novel technique for fabrication of nanostructures on silicon carbide using amorphization and oxidation”, Nanotechnology, 17, 4514 (2006)
- S. K. Dixit, **S. Dhar**, J. Rozen, R. Schrimpf, D. M. Fleetwood, S. T. Pantelides and L. C. Feldman, “Total dose radiation response of nitridated and non-nitridated SiO₂/4H-SiC MOS capacitors”, IEEE Transactions on Nuclear Science, 56, 3687 (2006)
- S. H. Choi, D. Wang, M. Park, J. R. Williams, W. Lu, **S. Dhar** and L. C. Feldman, “ Nitridation of the SiO₂/SiC interface studied by surface-enhanced Raman spectroscopy”, Applied Surface Science, 253, 5411 (2007)
- **S. Dhar**, L.C. Feldman, S.T. Pantelides, S. Wang, and J.R. Williams, “Passivation of silicon dioxide layers on silicon carbide”, MRS Bulletin, 30, 288 (2005)
- **S. Dhar**, L. C. Feldman K. -C. Chang, Y. Cao, L. M. Porter, J. Bentley and J.R. Williams, “Nitridation anisotropy in SiO₂/4H-SiC”, Journal of Applied Physics, 97, 074902 (2005)
- **S. Dhar**, L.C. Feldman, S. Wang, T. Isaacs-Smith, and J.R. Williams, “Interface trap passivation for SiO₂/(0001) C-terminated 4H-SiC”, Journal of Applied Physics, 98, 014902 (2005)
- R. Kalish, **S. Dhar** and L. C. Feldman, “Depth profiles, surface damage and lattice location of boron/deuterium co-doped diamond”, Diamond and Related Materials, 14, 1600 (2005)
- K.-C. Chang, Y. Cao, L.M. Porter, J. Bentley, **S. Dhar**, L.C. Feldman and J. R. Williams, “High Resolution Elemental Profiles of the Silicon Dioxide/4H-Silicon Carbide Interface”, Journal of Applied Physics, 97, 104920 (2005)
- **S. Dhar**, Y.W. Song, L.C. Feldman, T.I. Smith, C.C. Tin, J.R. Williams, G. Chung, T. Nishimura, D. Starodub, T. Gustafsson and E. Garfunkel, “Effect of nitric oxide annealing on the interface trap densities near the conduction band-edge at the oxide/ (1120) 4H- SiC interface” Applied Physics Letters, **84**, 1498 (2004)
- Y. Song, **S. Dhar**, L.C. Feldman, G. Chung and J.R. Williams, “Modified Deal Grove model for the thermal oxidation of SiC”, Journal of Applied Physics, 95, 4953 (2004)
- W. Lu, L.C. Feldman, Y. Song, **S. Dhar**, W.E. Collins and W.C. Mitchel, “Graphitic features on SiC surface following oxidation and etching using surface enhanced Raman spectroscopy”, Applied Physics Letters, 85, 3495 (2004)

BOOK CHAPTER:

- **S. Dhar**, S.T. Pantelides, J. R. Williams and L.C. Feldman, “Silicon dioxide-Silicon Carbide interfaces: Current status and recent advances” in *Defects in Microelectronic Materials and Devices*, eds. D. M. Fleetwood, S. T. Pantelides and R. D. Schrimpf, Taylor and Francis/CRC Press (USA) 2008.

SELECTED CONFERENCE PROCEEDINGS AND PRESENTATIONS:

- S.-H. Ryu, B.Hull, **S. Dhar**, L. Cheng, Q. Zhang, J. Richmond, M. Das, A. Agarwal, J. Palmour, A. Lelis, C. Scozzie and B. Geil, “Performance, reliability and robustness of 4H-SiC power DMOSFETs”, Materials Science Forum, 645-648, 969 (2010)) Peer-Reviewed
- A. Basile, **S. Dhar**, J. Rozen, X. D. Chen, L. C. Feldman, J. R. Williams and P.M. Mooney, “ Near-interface traps in n-type 4H-SiC MOS capacitors from energy resolved CCDLTS”, Materials Research Society symposium proceedings, 1246, 207 (2010) Peer-Reviewed
- S.-H. Ryu, **S. Dhar**, S. K. Haney, A. Agarwal, A. Lelis, C. Scozzie and B. Geil“Critical issues for MOS based power devices in 4H-SiC”, Materials Science Forum, 615-617, 743 (2009) Peer-Reviewed
- “The silicon carbide-silicon dioxide interface: Current status and recent advances”, invited talk presented at the Gordon Research Conference on ‘Defects in Semiconductors’, New London, NH, August 2008
- “Nitrogen and hydrogen induced trap passivation at the SiO₂/4H-SiC interface” invited talk presented at the International conference of Silicon Carbide and Related Materials, Pittsburgh, PA, September 2005
- “Interface passivation of silicon dioxide layers on silicon carbide”, invited talk presented at the International Semiconductor Device Research Conference, Bethesda, MD, December 2005