Stanford

Krishna Saraswat

Rickey/Nielsen Professor in the School of Engineering, Emeritus

Electrical Engineering

Curriculum Vitae available Online

Bio

BIO

Saraswat is working on a variety of problems related to new and innovative materials, structures, and process technology of silicon, germanium and III-V devices and interconnects for VLSI and nanoelectronics. Areas of his current interest are: new device structures to continue scaling MOS transistors, DRAMs and flash memories to nanometer regime, 3-dimentional ICs with multiple layers of heterogeneous devices, metal and optical interconnections and high efficiency and low cost solar cells.

ACADEMIC APPOINTMENTS

- Professor Emeritus, Electrical Engineering
- Affiliate, Precourt Institute for Energy

HONORS AND AWARDS

- University Researcher of the Year Award, Semiconductor Industry Association (SIA) (2012)
- Alum of the Year Award, BITS Pilani, India (2012)
- Technovisionary Award, India Semiconductor Association (2007)
- Inventor Recognition Award, MARCO/FCR (2007)
- Andrew S. Grove Award, IEEE (2004)
- Rickey/Nielsen Professor School of Engineering, Stanford University (2004)
- Thomas Callinan Award, the Electrochemical Society 1989 Fellow, IEEE (2000)
- Inventor recognition award, Semiconductor Research Corporation (1987)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member of the Board of Directors, Lam Research Corp. (2012 - 2017)
- Member of the Board of Directors, Photonic Corp. (2007 - 2017)
- Member of technical advisory Board, Solexel Corp (2007 - 2017)
- Member of technical advisory Board, Intermolecular (2012 - 2016)
- Life Fellow, IEEE (1974 - present)
- Member of the Board of Directors, Novellus Corp. (2011 - 2012)

PROGRAM AFFILIATIONS

- Stanford SystemX Alliance

PROFESSIONAL EDUCATION

- PhD, Stanford University , EE (1974)
- MS, Stanford University , EE (1969)
- BE, BITS Pilani, India , Electronics (1968)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

New and innovative materials, structures, and process technology of semiconductor devices, interconnects for nanoelectronics and solar cells.

Teaching

COURSES

2023-24

- Advanced Integrated Circuits Technology: EE 311 (Spr)
- Integrated Circuit Fabrication Laboratory: EE 312 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Tyler Colenbrander, Jasmine Cox, Jimmy Qin, Jerry Yang

Doctoral (Program)

Jeongkyu Kim

Publications

PUBLICATIONS

- **Understanding Interface-Controlled Resistance Drift in Superlattice Phase Change Memory** *IEEE ELECTRON DEVICE LETTERS*
  Wu, X., Khan, A., Ramesh, P., Perez, C., Kim, K., Lee, Z., Saraswat, K., Goodson, K. E., Wong, H., Pop, E.
  2022; 43 (10): 1669-1672
- **Fast-Response Flexible Temperature Sensors with Atomically Thin Molybdenum Disulfide.** *Nano letters*
  Daus, A., Jaikissoon, M., Khan, A. I., Kumar, A., Grady, R. W., Saraswat, K. C., Pop, E.
  2022
- **Unveiling the Effect of Superlattice Interfaces and Intermixing on Phase Change Memory Performance.** *Nano letters*
  Khan, A. I., Wu, X., Perez, C., Won, B., Kim, K., Ramesh, P., Kwon, H., Tung, M. C., Lee, Z., Oh, I., Saraswat, K., Asheghi, M., Goodson, et al
  2022
- **High-Efficiency WSe2 Photovoltaic Devices with Electron-Selective Contacts.** *ACS nano*
  Kim, K., Andreev, M., Choi, S., Shim, J., Ahn, H., Lynch, J., Lee, T., Lee, J., Nazif, K. N., Kumar, A., Kumar, P., Choo, H., Jariwala, et al
  2022
- **Direct measurement of nanoscale filamentary hot spots in resistive memory devices.** *Science advances*
  Deshmukh, S., Rojo, M. M., Yalon, E., Vaziri, S., Koroglu, C., Islam, R., Iglesias, R. A., Saraswat, K., Pop, E.
  2022; 8 (13): eabk1514
- **High-specific-power flexible transition metal dichalcogenide solar cells.** *Nature communications*
  Nassiri Nazif, K., Daus, A., Hong, J., Lee, N., Vaziri, S., Kumar, A., Nitta, F., Chen, M. E., Kananian, S., Islam, R., Kim, K., Park, J., Poon, et al
  2021; 12 (1): 7034

- **Toward Low-Temperature Solid-Source Synthesis of Monolayer MoS2.** *ACS applied materials & interfaces*
  Tang, A., Kumar, A., Jaikissoon, M., Saraswat, K., Wong, H. P., Pop, E.
  2021
- **Strong Reduction in Ge Film Reflectivity by an Overlayer of 3 nm Si Nanoparticles: Implications for Photovoltaics** *ACS APPLIED NANO MATERIALS*
  Rezk, A., Hadi, S., Ashraf, J. M., Alhammadi, A., Alnaqbi, W., Kumar, A., Dushaq, G., Rasras, M. S., Saraswat, K. C., Nayfeh, M., Nayfeh, A.
  2021; 4 (5): 4602-4614
- **High-Performance p-n Junction Transition Metal Dichalcogenide Photovoltaic Cells Enabled by MoOx Doping and Passivation.** *Nano letters*
  Nassiri Nazif, K., Kumar, A., Hong, J., Lee, N., Islam, R., McClellan, C. J., Karni, O., van de Groep, J., Heinz, T. F., Pop, E., Brongersma, M. L., Saraswat, K. C.
  2021
- **Sixteen Channel Array Coil Optimization for Real-Time MRI Study of Granular Dynamics**
  Kumar, A., Mizsei, G., Zia, W., Lee, R. F., Boyce, C. M., IEEE
  IEEE.2021
- **Sub-200 Omega.mu m Alloyed Contacts to Synthetic Monolayer MoS2**
  Kumar, A., Schauble, K., Neilson, K. M., Tang, A., Ramesh, P., Wong, H., Pop, E., Saraswat, K., IEEE
  IEEE.2021
- **Improved Contacts to Synthetic Monolayer MoS2 - A Statistical Study**
  Kumar, A., Tang, A., Wong, H., Saraswat, K., IEEE
  IEEE.2021
- **Free-standing 2.7 mu m thick ultrathin crystalline silicon solar cell with efficiency above 12.0% (vol 70, 104466, 2020)** *NANO ENERGY*
  Xue, M., Nazif, K., Lyu, Z., Jiang, J., Lu, C., Lee, N., Zang, K., Chen, Y., Zheng, T., Kamins, T. I., Brongersma, M. L., Saraswat, K. C., Harris, et al
  2020; 72
- **Free-standing 2.7 mu m thick ultrathin crystalline silicon solar cell with efficiency above 12.0%** *NANO ENERGY*
  Xue, M., Nazif, K., Lyu, Z., Jiang, J., Lu, C., Lee, N., Zang, K., Chen, Y., Zheng, T., Kamins, T., Brongersma, M. L., Saraswat, K. C., Harris, et al
  2020; 70
- **Doped WS2 transistors with large on-off ratio and high on-current**
  Kumar, A., Nazif, K., Ramesh, P., Saraswat, K., IEEE
  IEEE.2020
- **Silicon compatible optical interconnect and monolithic 3-D integration**
  Saraswat, K. C., IEEE
  IEEE.2020
- **Device and materials requirements for neuromorphic computing** *JOURNAL OF PHYSICS D-APPLIED PHYSICS*
  Islam, R., Li, H., Chen, P., Wan, W., Chen, H., Gao, B., Wu, H., Yu, S., Saraswat, K., Wong, H.
  2019; 52 (11)
- **On the limit of defect doping in transition metal oxides** *JOURNAL OF VACUUM SCIENCE & TECHNOLOGY A*
  Kumar, A., Islam, R., Pramanik, D., Saraswat, K.
  2019; 37 (2)
- **Silicon-Compatible Fabrication of Inverse Woodpile Photonic Crystals with a Complete Band Gap** *ACS PHOTONICS*
  Gupta, S., Tietz, S., Vuckovic, J., Saraswat, K.
  2019; 6 (2): 368–73
- **Infrared Detectable MoS2 Phototransistor and Its Application to Artificial Multilevel Optic-Neural Synapse.** *ACS nano*
  Kim, S. G., Kim, S. H., Park, J. n., Kim, G. S., Park, J. H., Saraswat, K. C., Kim, J. n., Yu, H. Y.
  2019
- **Towards high V-oc, thin film, homojunction WS2 solar cells for energy harvesting applications**
  Nazif, K., Kumar, A., de Menezes, M., Saraswat, K.

edited by Matin, M., Lange, A. P., Dutta, A. K.
SPIE-INT SOC OPTICAL ENGINEERING.2019

- **Limitation of Optical Enhancement in Ultra-thin Solar Cells Imposed by Contact Selectivity** *SCIENTIFIC REPORTS*
  Islam, R., Saraswat, K.
  2018; 8: 8863

- **Carrier-selective interlayer materials for silicon solar cell contacts** *JOURNAL OF APPLIED PHYSICS*
  Xue, M., Islam, R., Chen, Y., Chen, J., Lu, C., Pleus, A., Tae, C., Xu, K., Liu, Y., Kamins, T. I., Saraswat, K. C., Harris, J. S.
  2018; 123 (14)

- **Room temperature lasing unraveled by a strong resonance between gain and parasitic absorption in uniaxially strained germanium** *PHYSICAL REVIEW B*
  Gupta, S., Nam, D., Vuckovic, J., Saraswat, K.
  2018; 97 (15)

- **Investigation of Nickel Oxide as Carrier-selective Interlayer for Silicon Solar Cell Contacts**
  Xue, M., Islam, R., Chen, Y., Lu, C., Lyu, Z., Zang, K., Jia, J., Deng, H., Kamins, T., Saraswat, K., Harris, J., IEEE
  IEEE.2018: 2180–82

- **Low-threshold optically pumped lasing in highly strained germanium nanowires** *NATURE COMMUNICATIONS*
  Bao, S., Kim, D., Onwukaeme, C., Gupta, S., Saraswat, K., Lee, K., Kim, Y., Min, D., Jung, Y., Qiu, H., Wang, H., Fitzgerald, E. A., Tan, et al
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- **Low-threshold optically pumped lasing in highly strained germanium nanowires.** *Nature communications*
  Bao, S., Kim, D., Onwukaeme, C., Gupta, S., Saraswat, K., Lee, K. H., Kim, Y., Min, D., Jung, Y., Qiu, H., Wang, H., Fitzgerald, E. A., Tan, et al
  2017; 8 (1): 1845

- **Contact Selectivity Engineering in a 2 mum Thick Ultrathin c-Si Solar Cell Using Transition-Metal Oxides Achieving an Efficiency of 10.8.** *ACS applied materials & interfaces*
  Xue, M., Islam, R., Meng, A. C., Lyu, Z., Lu, C., Tae, C., Braun, M. R., Zang, K., McIntyre, P. C., Kamins, T. I., Saraswat, K. C., Harris, J. S.
  2017

- **Nanoislands-Based Charge Trapping Memory: A Scalability Study** *IEEE TRANSACTIONS ON NANOTECHNOLOGY*
  El-Atab, N., Saadat, I., Saraswat, K., Nayfeh, A.
  2017; 16 (6): 1143–46

- **Three-dimensional integration of nanotechnologies for computing and data storage on a single chip** *NATURE*
  Shulaker, M. M., Hills, G., Park, R. S., Howe, R. T., Saraswat, K., Wong, H., Mitra, S.
  2017; 547 (7661): 74-+

- **) Due to UV/Ozone Treatment.** *ACS applied materials & interfaces*
  Islam, R., Chen, G., Ramesh, P., Suh, J., Fuchigami, N., Lee, D., Littau, K. A., Weiner, K., Collins, R. T., Saraswat, K. C.
  2017; 9 (20): 17201-17207

- **Passivation of multiple-quantum-well Ge0.97Sn0.03/Ge p-i-n photodetectors** *APPLIED PHYSICS LETTERS*
  Morea, M., Brendel, C. E., Zang, K., Suh, J., Fenrich, C. S., Huang, Y., Chung, H., Huo, Y., Kamins, T. I., Saraswat, K. C., Harris, J. S.
  2017; 110 (9)

- **Single-Event Measurement and Analysis of Antimony-Based p-Channel Quantum-Well MOSFETs With High-kappa Dielectric** *IEEE TRANSACTIONS ON NUCLEAR SCIENCE*
  Barth, M., Kumar, A., Warner, J. H., Bennett, B. R., Cress, C. D., Boos, J. B., Roche, N. J., Raine, M., Gaillardin, M., Paillet, P., McMorrow, D., Saraswat, K., Datta, et al
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- **Si Heterojunction Solar Cells: A Simulation Study of the Design Issues** *IEEE TRANSACTIONS ON ELECTRON DEVICES*
  Islam, R., Nazif, K. N., Saraswat, K. C.
  2016; 63 (12): 4788-4795

- **Anomalous threshold reduction from < 100 > uniaxial strain for a low-threshold Ge laser** *OPTICS COMMUNICATIONS*
  Sukhdeo, D. S., Kim, Y., Gupta, S., Saraswat, K. C., Dutt, B. R., Nam, D.

2016; 379: 32-35

- **Theoretical Modeling for the Interaction of Tin Alloying With N-Type Doping and Tensile Strain for GeSn Lasers** *IEEE ELECTRON DEVICE LETTERS*
  Sukhdeo, D., Kim, Y., Gupta, S., Saraswat, K., Dutt, B., Nam, D.
  2016; 37 (10): 1307-1310
- **Improved Contacts to MoS2 Transistors by Ultra-High Vacuum Metal Deposition** *NANO LETTERS*
  English, C. D., Shine, G., Dorgan, V. E., Saraswat, K. C., Pop, E.
  2016; 16 (6): 3824-3830
- **Direct Bandgap Light Emission from Strained Germanium Nanowires Coupled with High-Q Nanophotonic Cavities.** *Nano letters*
  Petykiewicz, J., Nam, D., Sukhdeo, D. S., Gupta, S., Buckley, S., Piggott, A. Y., Vuckovic, J., Saraswat, K. C.
  2016; 16 (4): 2168-2173
- **Impact of minority carrier lifetime on the performance of strained germanium light sources** *OPTICS COMMUNICATIONS*
  Sukhdeo, D. S., Gupta, S., Saraswat, K. C., Dutt, B. (., Nam, D.
  2016; 364: 233-237
- **Ultimate limits of biaxial tensile strain and n-type doping for realizing an efficient low-threshold Ge laser** *JAPANESE JOURNAL OF APPLIED PHYSICS*
  Sukhdeo, D. S., Gupta, S., Saraswat, K. C., Dutt, B. (., Nam, D.
  2016; 55 (2)
- **56 Gb/s Germanium Waveguide Electro-Absorption Modulator** *JOURNAL OF LIGHTWAVE TECHNOLOGY*
  Srinivasan, S. A., Pantouvaki, M., Gupta, S., Chen, H. T., Verheyen, P., Lepage, G., Roelkens, G., Saraswat, K., Van Thourhout, D., Absil, P., Van Campenhout, J.
  2016; 34 (2): 419-424
- **Ge microdisk with lithographically-tunable strain using CMOS-compatible process** *OPTICS EXPRESS*
  Sukhdeo, D. S., Petykiewicz, J., Gupta, S., Kim, D., Woo, S., Kim, Y., Vuckovic, J., Saraswat, K. C., Nam, D.
  2015; 23 (26): 33249-33254
- **Surface Passivation of Germanium Using SF6 Plasma to Reduce Source/Drain Contact Resistance in Germanium n-FET** *IEEE ELECTRON DEVICE LETTERS*
  Kim, G., Kim, S., Kim, J., Shin, C., Park, J., Saraswat, K. C., Cho, B. J., Yu, H.
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- **Bandgap-customizable germanium using lithographically determined biaxial tensile strain for silicon-compatible optoelectronics** *OPTICS EXPRESS*
  Sukhdeo, D. S., Nam, D., Kang, J., Brongersma, M. L., Saraswat, K. C.
  2015; 23 (13): 16740-16749
- **Monolithic integration of germanium-on-insulator p-i-n photodetector on silicon** *OPTICS EXPRESS*
  Nam, J. H., Afshinmanesh, F., Nam, D., Jung, W. S., Kamins, T. I., Brongersma, M. L., Saraswat, K. C.
  2015; 23 (12): 15816-15823
- **Lateral overgrowth of germanium for monolithic integration of germanium-on-insulator on silicon** *JOURNAL OF CRYSTAL GROWTH*
  Nam, J. H., Alkis, S., Nam, D., Afshinmanesh, F., Shim, J., Park, J., Brongersma, M., Okyay, A. K., Kamins, T. I., Saraswat, K.
  2015; 416: 21-27
- **Reduction of Surface Roughness in Epitaxially Grown Germanium by Controlled Thermal Oxidation** *IEEE ELECTRON DEVICE LETTERS*
  Jung, W., Nam, J. H., Pal, A., Lee, J. H., Na, Y., Kim, Y., Lee, J. H., Saraswat, K. C.
  2015; 36 (4): 297-299
- **The Efficacy of Metal-Interfacial Layer-Semiconductor Source/Drain Structure on Sub-10-nm n-Type Ge FinFET Performances** *IEEE ELECTRON DEVICE LETTERS*
  Kim, J., Kim, G., Nam, H., Shin, C., Park, J., Kim, J., Cho, B. J., Saraswat, K. C., Yu, H.
  2014; 35 (12): 1185-1187
- **Schottky barrier height reduction for holes by Fermi level depinning using metal/nickel oxide/silicon contacts** *APPLIED PHYSICS LETTERS*

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- **Observation of improved minority carrier lifetimes in high-quality Ge-on-insulator using time-resolved photoluminescence** *OPTICS LETTERS*
  Nam, D., Kang, J., Brongersma, M. L., Saraswat, K. C.
  2014; 39 (21): 6205-6208
- **Specific Contact Resistivity Reduction Through Ar Plasma-Treated TiO2-x Interfacial Layer to Metal/Ge Contact** *IEEE ELECTRON DEVICE LETTERS*
  Kim, G., Kim, J., Kim, S., Jo, J., Shin, C., Park, J., Saraswat, K. C., Yu, H.
  2014; 35 (11): 1076-1078
- **New materials for post-Si computing: Ge and GeSn devices** *MRS BULLETIN*
  Gupta, S., Gong, X., Zhang, R., Yeo, Y., Takagi, S., Saraswat, K. C.
  2014; 39 (8): 678-686
- **Study of Carrier Statistics in Uniaxially Strained Ge for a Low-Threshold Ge Laser** *IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS*
  Nam, D., Sukhdeo, D. S., Gupta, S., Kang, J., Brongersma, M. L., Saraswat, K. C.
  2014; 20 (4)
- **Analytical Study of Interfacial Layer Doping Effect on Contact Resistivity in Metal-Interfacial Layer-Ge Structure** *IEEE ELECTRON DEVICE LETTERS*
  Kim, J., Kim, G., Shin, C., Park, J., Saraswat, K. C., Yu, H.
  2014; 35 (7): 705-707
- **Direct bandgap germanium-on-silicon inferred from 5.7% < 100 > uniaxial tensile strain [Invited]** *PHOTONICS RESEARCH*
  Sukhdeo, D. S., Nam, D., Kang, J., Brongersma, M. L., Saraswat, K. C.
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- **7-nm FinFET CMOS Design Enabled by Stress Engineering Using Si, Ge, and Sn** *IEEE TRANSACTIONS ON ELECTRON DEVICES*
  Gupta, S., Moroz, V., Smith, L., Lu, Q., Saraswat, K. C.
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- **Demonstration of a Ge/GeSn/Ge Quantum-Well Microdisk Resonator on Silicon: Enabling High-Quality Ge(Sn) Materials for Micro- and Nanophotonics.** *Nano letters*
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- **Improving Contact Resistance in MoS2 Field Effect Transistors** *72nd Annual Device Research Conference (DRC)*
  English, C. D., Shine, G., Dorgan, V. E., Saraswat, K. C., Pop, E.
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- **Atomic layer deposition of Al2O3 on germanium-tin (GeSn) and impact of wet chemical surface pre-treatment** *APPLIED PHYSICS LETTERS*
  Gupta, S., Chen, R., Harris, J. S., Saraswat, K. C.
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- **Antimonide-Based Heterostructure p-Channel MOSFETs With Ni-Alloy Source/Drain** *IEEE ELECTRON DEVICE LETTERS*
  Yuan, Z., Kumar, A., Chen, C., Nainani, A., Bennett, B. R., Boos, J. B., Saraswat, K. C.
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- **Effects of point defect healing on phosphorus implanted germanium n(+)/p junction and its thermal stability** *JOURNAL OF APPLIED PHYSICS*
  Shim, J., Shin, J., Lee, I., Choi, D., Baek, J. W., Heo, J., Park, W., Leem, J. W., Yu, J. S., Jung, W., Saraswat, K., Park, J.
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- **Theoretical Analysis of GeSn Alloys as a Gain Medium for a Si-Compatible Laser** *IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS*
  Dutt, B., Lin, H., Sukhdeo, D. S., Vulovic, B. M., Gupta, S., Nam, D., Saraswat, K. C., Harris, J. S.
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  Gupta, S., Chen, R., Huang, Y., Kim, Y., Sanchez, E., Harris, J. S., Saraswat, K. C.
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- **Experimental and theoretical investigation of phosphorus in-situ doping of germanium epitaxial layers** *CURRENT APPLIED PHYSICS*
  Yu, H., Battal, E., Okyay, A. K., Shim, J., Park, J., Baek, J. W., Saraswat, K. C.
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- **Strain-induced pseudoheterostructure nanowires confining carriers at room temperature with nanoscale-tunable band profiles.** *Nano letters*
  Nam, D., Sukhdeo, D. S., Kang, J., Petykiewicz, J., Lee, J. H., Jung, W. S., Vuckovic, J., Brongersma, M. L., Saraswat, K. C.
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- **Strain-Induced Pseudoheterostructure Nanowires Confining Carriers at Room Temperature with Nanoscale-Tunable Band Profiles** *NANO LETTERS*
  Nam, D., Sukhdeo, D. S., Kang, J., Petykiewicz, J., Lee, J. H., Jung, W. S., Vuckovic, J., Brongersma, M. L., Saraswat, K. C.
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- **Electrical Characterization of GaP-Silicon Interface for Memory and Transistor Applications** *IEEE TRANSACTIONS ON ELECTRON DEVICES*
  Pal, A., Nainani, A., Ye, Z., Bao, X., Sanchez, E., Saraswat, K. C.
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- **Achieving direct band gap in germanium through integration of Sn alloying and external strain** *JOURNAL OF APPLIED PHYSICS*
  Gupta, S., Magyari-Koepe, B., Nishi, Y., Saraswat, K. C.
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  Chen, R., Huang, Y., Gupta, S., Lin, A. C., Sanchez, E., Kim, Y., Saraswat, K. C., Kamins, T. I., Harris, J. S.
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- **Effects of Thermal Annealing on In Situ Phosphorus-Doped Germanium n(+)/p Junction** *IEEE ELECTRON DEVICE LETTERS*
  Shim, J., Song, I., Jung, W., Nam, J., Leem, J. W., Yu, J. S., Kim, D. E., Cho, W. J., Kim, Y. S., Jun, D., Heo, J., Park, W., Park, et al
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- **Effects of Oxidant Dosing on GaSb (100) prior to Atomic Layer Deposition and High-Performance Antimonide-based P-Channel MOSFETs with Ni-alloy S/D** *71st Device Research Conference (DRC)*
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  IEEE.2013: 25–26
- **GaP Source-Drain SOI 1T-DRAM: Solving the Key Technological Challenges** *IEEE International SOI-3D-Subthreshold Microelectronics Technology Unified Conference*
  Pal, A., Nainani, A., Ye, Z., Bao, X., Sanchez, E., Saraswat, K. C.
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- **A Group IV Solution for 7 nm FinFET CMOS: Stress Engineering Using Si, Ge and Sn** *IEEE International Electron Devices Meeting (IEDM)*
  Gupta, S., Moroz, V., Smith, L., Lu, Q., Saraswat, K. C.
  IEEE.2013
- **GaP Source-Drain Vertical Transistor on Bulk Silicon for 1-Transistor DRAM Application** *5th IEEE International Memory Workshop (IMW)*
  Pal, A., Saraswat, K. C., Nainani, A., Ye, Z., Bao, X., Sanchez, E.
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- **Germanium on insulator (GOI) Structure Locally Grown on Silicon Using Hetero Epitaxial Lateral Overgrowth** *IEEE International SOI-3D-Subthreshold Microelectronics Technology Unified Conference*

Nam, J. H., Jung, W. S., Shim, J., Ito, T., Nishi, Y., Park, J., Saraswat, K. C.
IEEE.2013

- **Approaches for a Viable Germanium Laser: Tensile Strain, GeSn Alloys, and n-Type Doping** *2nd IEEE-Photonics-Society Optical Interconnects Conference*
  Sukhdeo, D. S., Lin, H., Nam, D., Yuan, Z., Vulovic, B. M., Gupta, S., Harris, J. S., Dutt, B. (., Saraswat, K. C.
  IEEE.2013: 112–113
- **Germanium on Insulator (GOI) Structure Locally Grown on Silicon Using Hetero Epitaxial Lateral Overgrowth**
  Nam, J. H., Jung, W., S., Shim, J., Ito, T., Nishi, Y., Park, J, H., Saraswat, K.
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- **Limits of Specific Contact Resistivity to Si, Ge and III-V Semiconductors Using Interfacial Layers**
  Shine, G., Saraswat, Krishna, C.
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- **Performance Limitation of CMOS with Cu/low-k Interconnects and Possible Future Alternatives**
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