Saroj Dash

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Publications:http://scholar.google.com/citations?user=E5GiUL8AAAAJ&hl=en

Curriculum vitae

Current position

- Associate Professor (2015 - present): Permanent faculty position, Chalmers University of Technology, Quantum Device Physics Laboratory, Dept. of Microtechnology and Nanoscience, Göteborg, Sweden.
  - Leading a research group in the field of spintronics, quantum devices, and nanoelectronics using topological quantum materials such as Weyl and Dirac materials, topological insulators, graphene, and semiconductor based nanodevices.

Previous positions

- Assistant Professor (Nov. 2010 – 2015): Chalmers University of Technology, Göteborg, Sweden. Leader of a research group in the field of quantum device physics, nanoelectronics and spintronics.
- Postdoctoral Scientist (2010), University of Groningen, The Netherlands.
  Research - "Graphene/h-BN heterostructures", Supervisor - Prof. B.J. van Wees.
- Postdoctoral Scientist (2007-2010), University of Twente, The Netherlands.
  Research - "Silicon spintronics", Supervisors - Prof. Ron Jansen, Prof. M.P. de Jong.

Education and degrees

- Ph.D in Physics (August 2007) Max-Planck-Institute, Stuttgart, Germany.
  Dissertation title: "Towards Spin Injection into Silicon".
  Supervisors: Prof. H.D. Carstanjen and Dr. D. Goll, in the group of Prof. G. Schuetz.
- Master in Technology (2001-03) Solid State Materials, Indian Institute of Technology (IIT) - Delhi, India.
  Supervisors: Prof. R. Chatterjee and Prof. B.S. Panwar.

Supervision

- PhD thesis: – Andre Dankert, (2011– 15), Main supervisor, at Chalmers.
  – Dmitrii Khokhriakov, (2016 – cont.), Main supervisor, at Chalmers.
  – Bogdan Karpiak, (2017– cont.), Main supervisor, at Chalmers.
  – Bing Zhao, (2016 – cont.), Guest student from China, Main supervisor at Chalmers.
  – Anamul Hoque, (2018 – cont.), Main supervisor, at Chalmers.
  – Sandeep Sharma, (2009 –13), Daily-supervisor, University of Twente
  Licentiate (1/2 PhD) – Andre Dankert (2011 – 13), Main supervisor, at Chalmers.
- Postdocs: – Dr. Venkata K. Mutta (2012 – 15), Main supervisor at Chalmers.
  – Dr. Andre Dankert (2015 – 18), Main supervisor at Chalmers.
  – Dr. Craig Polley (2017– 18), Main supervisor at Chalmers.
- Master thesis –14 students at Chalmers (2011–19); 1 at Uni. Twente (2009), 3 at MPI (2004-07).
- Bachelor thesis –7 students at Chalmers (2011–17); 2 students (2002) at IIT-Delhi.

Teaching

- Semiconductor Materials Physics (FMI 040), for Masters and PhD students, (2016 – cont. : Examiner).
- Semiconductor Physics (2015), for PhD students.
- Nanoscience (MCC026) for Master students, 2013, 2014, 2015.
- Modelling and fabrication of micro/nanodevices (MCC115) – 2011, 2012, 2014, 2015, 2019.
- Applied Spintronics: at GU for students of Chalmers, GU and KTH. (2011).

Pedagogical developments

- Obtained training on Academic Leadership, Team building, Coaching, Conflict and time management.
- Pedagogical courses - Supervision; Teaching; Learning; Pedagogical Project; Practices of science.

National and international assignments of importance

- Invited talks - > 50 at major international conferences, workshops, and colloquia.
- Editorial Board member of Scientific Reports (Nature Publishing).
- Scientific Advisory board of Graphene centre at Chalmers,
- PhD defence committee 2013 - Sandeep Sharma, PhD thesis at Uni. Groningen, Netherlands.
  2015 - Yajun Wei, PhD thesis at Uppsala University, Sweden.
  2017 - Roald Ruiter, PhD thesis at Uni. Groningen, Netherlands.
  2017 – Matthew Barnes, PhD thesis at University of Exeter, UK.
  2018 - Yuqing Huang, PhD thesis at Linköping University, Sweden.
  2018 - Yi You, PhD thesis at University of New South Wales Sydney, Australia.
  2018 - Maja Feierabend, Licentiate thesis at Chalmers, Sweden.
- Refereeing Journals – Nature, Science, Nature X journals, Phys. Rev. Lett., Adv. Materials, Nano Lett. ACS Nano, Phys. Rev. X, Phys. Rev. Lett., Scientific Reports, Appl. Phys. Lett., J. Appl. Phys, IEEE.
- Reviewing Grants – ERC consolidator grant 2017, USA Energy Foundation grant 2018, French Science foundation 2015, 2017, 2018, 2019; Austria Science grant 2014, Israel Science grant 2013, 2017, 2019.

Distinctions, Scholarships and Grants

2018-20 – EU Graphene Flagship, Spintronics WP, PI.
2019 -20 – Chalmers NanoAoA, Quantum optics with 2D semiconductor, co-PI.
2017-20 – VR Project grant, Dirac materials heterostrcutures, PI.
2018-20 – Chalmers Graphene center, 2D materials growth grant, PI.
2016-18 – EU Graphene Flagship, Spintronics WP, PI.
2016-18 – EU Eranet, Flag-Era with 5 EU partners, Graphene spintronics,PI.
2017-19 – Max-IV– Chalmers collaboration grant, PI.
2015-16 – Chalmers Innovation center, Proof of concept of 2D heterostructures, PI.
2015-17 – VINNOVA, Graphene spintronic devices, co-PI with GU and NanoOsc.
2013-17 – VR Young Researcher Grant, Sweden, Silicon spintronics, PI.
2012-16 – Marie Curie Career Integration, EU, Silicon spintronics, PI.
2010-14 – AoA Nano Starting grant, Chalmers, Sweden, PI.
2011-19 – AoA Nano Chalmers High risk grants, PI, 4 times.
2010 – FOM postdoc fellowship, University of Groningen, Netherlands.
2007-09 – Strategic Research NWO postdoc fellowship, Uni. of Twente, Netherlands.
2004-07 – Max Planck Institute PhD scholarship, Stuttgart, Germany.
2002 – Dept. of Science and Technology, India scholarship at IIT Delhi.

Professional Achievements

Saroj Dash is an Associate Professor and a research group leader at Quantum Device Physics Laboratory at Chalmers University of Technology, Sweden. His research focuses on Nano device fabrication, and Electronic Quantum and Spin transport measurement; using Graphene, 2D semiconductors, Topological Insulators, Weyl-semimetals and van der Waals heterostructures of 2D materials based Nanoelectronic devices. He holds a PhD degree in Physics from Max Planck Institute (2007, Stuttgart, Germany). His previous positions include postdocs at Uni. of Twente and Uni. of Groningen in Netherlands for three years. Saroj Dash was first appointed at Chalmers in November 2010 as an Assistant Professor in an international competition with a starting grant from the Swedish Nano Areas of Advance program. He obtained the Associate Professor position (permanent) in 2015. He has secured several national and international funding for his research. His position at Chalmers included a start-up grant from Nano AoA. Subsequently, he has successfully attracted funding as main PI from EU FP7 Marie Curie career integration grant, Swedish research council VR young research grant, EU ERNET FlagEra with 5 EU partners, Swedish research council VR project grant, and EU Graphene Flagship.

Saroj Dash has given>50 invited talks in major international conferences and colloquia. He is supervising several postdocs, PhDs and master students at Chalmers and involved in teaching in several nanoscience and Physics courses. He has also served as scientific advisor for conferences and journals, thesis examination committee, reviewer of several journals and grant agencies. He is presently an editorial board member of Scientific Reports (Nature publishing). He has done seminal works on nanoelectronics and spintronics with semiconductors, topological insulators, Weyl semimetals, graphene, 2D semiconductors, material based devices, which is well recognized in the scientific community with over 42 publications in high impact journals (Nature, Nature materials, Science Advances, 2 in Nature commun., 2 in Nano Lett, 2 in ACS Nano, Sci. Rep., Phys. Rev. B, Appl. Phys. Lett.) with > 2580 citations, h index -22, i-10 index – 27, Avg. citation per article: ~60.

Research highlights

Overview of publication records

- Publications in **N**ature, Nature materials, Science Advances, 2 in Nature communications., 2 in Nano Lett., 2 in ACS Nano, Small, Nano Res., 4 in Sci. Rep., 5 in Phys. Rev. B, 8 in Appl. Phys. Lett.,
- 42 publications, > 2580 citations, most cited papers - 610, 252,180,147,142,128,123,112, 112, 93 times.
- h-index: 22; Avg. citation per paper: 60, Invited talks > 50
- Full publication list - https://scholar.google.se/citations?user=E5GiUL8AAAAJ&hl=en

- **Weyl Semimetals –** Experimental observation of Spin Hall Effects in Weyl Semimetal WTe_2, preprint arXiv:1812.02113; Submitted (2018).

- **Topological Insulator – Graphene heterostructures –** Spin texture in Dirac Materials Heterostructures Science Advances 4 (9), eaat9349 (2018).
  News - https://www.sciencedaily.com/releases/2018/10/181016110102.htm

- **Topological Insulators** – Electrical Detection of Spin Polarized Currents in Topological Insulators at Room Temperature. Nano Letters 15 (12), 7976 (2015)
  http://pubs.acs.org/doi/abs/10.1021/acs.nanolett.5b03080
  News - https://www.sciencedaily.com/releases/2015/12/151207081831.htm

- **Graphene/MoS_2 heterostructures** – Electrical gate control of spin current in van der Waals heterostructures at room temperature, Nature Communications 8, 16093 (2017).
  https://www.nature.com/articles/ncomms16093
  News - https://graphene-flagship.eu/field-effect-transistor-using-graphenes-electron-spin

- **Graphene Spintronics** – Long distance spin communication in CVD graphene
  Nature Communications, 6, 6766 (2015), http://www.nature.com/articles/ncomms7766
  http://phys.org/news/2015-04-graphene-future-spintronic-devices.html
  Review article: http://iopscience.iop.org/article/10.1088/2053-1583/2/3/030202/meta
  Book chapter: http://www.worldscientific.com/doi/abs/10.1142/9789813149823_0009

- **Tunnel spin injection through h-BN and MoS_2 barriers** –
  Graphene/h-BN heterostructures –
  Scientific Reports 6, 21168 (2016); http://www.nature.com/articles/srep21168;
  Scientific Reports 4, 6146 (2014); http://www.nature.com/articles/srep06146
  TMR devices –
  h-BN TMR - Nano Res. 8, 1357, (2015) http://link.springer.com/article/10.1007/s12274-014-0627-4
  MoS_2 TMR - ACS Nano 11 (6), 6389 (2017) http://pubs.acs.org/doi/abs/10.1021/acsnano.7b02819

- **2D semiconductor growth and transistors** –
  - MoS_2 field effect transistor, ACS Nano, 8 (1), 476, (2014).
    http://pubs.acs.org/doi/abs/10.1021/nn404961e
  - CVD growth of MoS_2 (Nano Lett., 14 (8), pp 4314–4321, (2014).
    http://pubs.acs.org/doi/abs/10.1021/nl501106v
  - Black Phosphorous field effect devices (Small 11, 2209–2216 (2015).
    http://onlinelibrary.wiley.com/doi/10.1002/smll.201402900/full

- **Silicon spintronics** –
  - Electrical creation of spin polarization in silicon at room temperature"
    Dash et al. **Nature** 462, 491 (2009).
    http://www.nature.com/nature/journal/v462/n7272/abs/nature08570.html
    http://www.nature.com/nature/journal/v462/n7272/edsumm/e091126-05.html
    Most significant breakthroughs in 2009 (3rd on the list) by Physics world.
    http://physicsworld.com/cws/article/news/2009/dec/21/breakthrough-of-the-year
  - Electric field manipulation of spin polarization in silicon quantum structures, **Nature materials** 9, 133 (2010); http://www.nature.com/nmat/journal/v9/n2/abs/nmat2605.html
  - Inverted Hanle effect in semiconductors (Phys. Rev. B 84, 5, 054410 (2011).
    http://journals.aps.org/prb/abstract/10.1103/PhysRevB.84.054410
  - Thermal creation of electron spin polarization in n-type silicon (Applied Physics Letters 103 (24), 242405 (2014). http://aip.scitation.org/doi/full/10.1063/1.4845295

Selected publications

• Full publication list - https://scholar.google.se/citations?user=E5GiUL8AAAAJ&hl=en

1. Observation of Spin Hall Effects in Semimetal WTe_2,
   B Zhao, D. Khokhriakov, B. Karpiak, A. Md. Hoque, X. Xu, Y. Jiang, B. Yan, SP Dash,
   arXiv preprint arXiv:1812.02113; Submitted (2018).

2. Tailoring emergent spin phenomena in Dirac material heterostructures
   D Khokhriakov, AW Cummings, K Song, M Vila, B Karpiak, A Dankert, S. Roche, SP Dash
   Science Advances 4 (9), eaat9349 (2018). I.F. -11.5
   News - https://www.sciencedaily.com/releases/2018/10/181016110102.htm

3. Electrical gate control of spin current in van der Waals heterostructures at room temperature
   A Dankert, SP Dash;
   Nature Communication 8, 16093 (2017). I.F. -12.3 Citations – **62**
   News - https://phys.org/news/2017-07-graphene.html; https://graphene-flagship.eu/field-effect-transistor-using-graphenes-electron-spin

4. Long distance spin communication in CVD graphene at room temperature
   M.V. Kamalakar, G. Chris, A Dankert, SP Dash;
   Nature Communication 6, 6766 (2015), I.F. -12.3 Citations– **119**
   News - https://phys.org/news/2015-04-graphene-future-spintronic-devices.html

5. Room Temperature Electrical Detection of Spin Polarization in Topological Insulators
   A Dankert, J. Geur, M.V. Kamalakar, SP Dash;
   Nano Letters 15 (12) 7976 (2015), I.F. -12 Citations– **88**
   News - https://www.sciencedaily.com/releases/2015/12/151207081831.htm

6. High performance MoS_2 Field Effect Transistors with Spin Tunnel Contacts
   A Dankert, L Langouche, MV. Kamalakar, SP Dash;
   ACS Nano 8 (1), 476 (2014). I.F. -13.7 Citations – **132**

7. Enhanced Tunnel Spin Injection into Graphene using CVD Hexagonal Boron Nitride;
   MV Kamalakar, A Dankert, J Bergsten, T Ive, SP Dash;
   Scientific Reports, 4: 61446 (2014). I.F.- 4.1 Citations– **110**
8. A transfer technique for high mobility graphene devices on hexagonal boron nitride;
   P Zomer, SP Dash, N Tombros, B van Wees;
   Appl. Phys. Lett. 99 , 232104 (2011). I.F. -3.5 Citations– **252**

9. Oscillatory spin-polarized tunnelling from silicon quantum wells controlled by electric field
   R Jansen, BC Min, SP Dash;
   Nature Materials 9, 133 (2010). I.F.- 39 Citations – 41

10. Spin precession and inverted Hanle effect in a semiconductor near a finite-roughness ferromagnetic interface
    SP Dash, S Sharma, JC Le Breton, J Peiro, H Jaffrès, JM George, ...
    Physical Review B 84 (5), 054410 (2011). I.F.- 3.8 Citations – **180**

11. Electrical creation of spin polarization in silicon at room temperature
    SP Dash, S Sharma, RS Patel, MP De Jong, R Jansen;
    Nature 462, 491 (2009). I.F. – 41 Citations – **610**
    Most significant breakthroughs in 2009 (3rd on the list) by Physics world.
    News - http://www.nature.com/news/2009/091125/full/news.2009.1107.html