

Curriculum Vitae Vanya Darakchieva

Semiconductor materials, IFM, Linköping University

Associate Professor

Subdivision Manager

SSF Future Research leaders fellow

VINNMER Fellow

2013 Paul Drude Award Winner

Group Leader

<http://www.ifm.liu.se/materialphysics/semicond/staff/vanya/index.xml>

Research Summary

I am working on the development of novel semiconductor and nanoscale materials, and spectroscopic metrology for ultra-fast electronics and optoelectronics that will greatly improve computation and communication capabilities. A major goal is to produce significant progress in understanding of epitaxial graphene properties towards device-grade epitaxial *graphene* for implementation in high-speed electronics and THz-frequency large scale processor technologies. To achieve this I apply unique ellipsometry techniques to study, understand and optimize the transport, electronic and structural properties of epitaxial graphene grown on SiC by sublimation. Further current efforts are concentrated on understanding the mechanisms that generate and control the transport properties in epitaxial layers of *group-III nitrides* (*InN*, *InAlN*, *AlGaIn*) for high-power electronic applications and novel solid state lighting. Most recent work focuses on building a THz ellipsometer, which will be the core of a unique *THz and magneto-ellipsometry center* at Linköping University. The unprecedented capabilities of this new instrumentation are the gathering meaningful information about electronic and spin transport with no physical contacts that can result in surface damage or sample contamination. The technology would be the first of its kind in Europe and could transform research into advanced semiconductor-, nano-, and bio-materials.

1. Doctoral Degree

09/2004 - Linköping University, Sweden, Scientific Area: Materials Science;

Effective date of PhD degree **24th April 2006** (according to parental leave after the PhD)

Thesis: *Strain-related structural and vibrational properties of group-III nitride layers and superlattices*; Supervisor: Dr. Tanya Paskova and Prof. Bo Monemar

2. Postdoctoral Work

2008 - 2010 Visiting Senior Researcher, Instituto Tecnológico e Nuclear, Portugal

2006 - 2010 Visiting Postdoc/Professor, University of Nebraska-Lincoln, USA, Prof. M. Schubert

2006 – 2007 Visiting postdoc, KTH, Stockholm, Sweden, Prof. S. Lourdudoss

3. Qualification as Docent

03/2009 - Docent in Semiconductor materials, Linköping University, Swede

4. Current position

2012 – permanent Associate Professor - IFM, Linköping University, Sweden,
Deputy division manager at the Semiconductor Materials division since 2013

5. Previous positions and periods of appointments

2006 - 2011 Assistant Professor, IFM, Linköping University, Sweden

2008-2010 Senior Researcher, Instituto Tecnológico e Nuclear, Sacavém, Portugal

2000 - 2004 PhD student, IFM, Linköping University, Sweden

1997 - 2000 Research Associate, Faculty of Physics, Sofia University, Bulgaria

6. **Parental leave** – total 29 months and 27 days, after PhD – 19 months; Effective date of PhD degree **24th April 2006**

7. **Fellowships and Awards**

2013 Future Research Leader Award SSF – FFL5

2013 **Paul Drude Award** – given to a young scientist for exceptional contributions to the development and application of spectroscopic ellipsometry.

2012 - 2015 VINNMER fellow to University of Nebraska-Lincoln and J. A. Woollam Co. US, International Qualification Marie Curie Fellowship, VINNOVA

2008 – 2010 Advanced fellowship for visiting senior researchers –grant by the National Science Foundation (FCT), Portugal

2006 – 2009 Assistant Professorship, Linköping University, Sweden - grant by the Swedish Research Council for junior research position FoAss

8. **Doctoral students (main supervisor)**

Mengyao Xie (LiU) graduated 12. 12. 2012

Chamseddine Bouhafs (LiU) expected graduation 2015

9. **Postdoctoral Researchers (main supervisor):** Vallery Stanishev 2012-2014, Nebiha Ben Sedrine 2009-2013, Marcus Gonschorek 2007/03

10. **Teaching qualifications**

2012-present Lecturer and Examiner of Research Supervision at CUL, LiU, LiU; 2011 - present Course responsible, lecturer and examiner “Advanced Semiconductor Materials” LiU, 10 hp; 2011 – 2005 Lecturer in “NanoPhysics”, undergraduate/MSc course, “Growth of Semiconductors”, undergraduate/MSc course, “Physics of Semiconductors”, PhD course, all at LiU; 2007 - New Materials, MSc/undergraduate course, LiU; lecturer and examiner; 2005 “Epitaxial growth of semiconductors”, graduate course, Royal Institute of Technology, Stockholm, lecturer; 2001-2004 - Teaching assistant in Analytical Methods in Material Science, Linköping University

11. **Account of Scientific work and development**

Publications: 2 book-chapters, 1 review paper, 1 invited paper in International Innovation, 2 Feature articles in PanEuropean Networks and J. A. Woollam Co, and 88 papers in recognized scientific journals, >1110 ISI citations, h-index 18, **Researcher ID: H-3724-2012**

Reviewing: Applied Physics Letters, Computational Material Science, Journal of Applied Physics, Journal of Crystal Growth, Journal of the Electrochemical Society, Journal of Alloys and Compounds, Materials Chemistry and Physics, Physica B, Physica Status Solidi, Surface Science, Thin Solid Films, Vacuum

Invited Talks: 2013 Int. Conf. on Spectroscopic Ellipsometry, ICSE-VI, Kyoto, Japan
2013 Nordic Semiconductor meeting, Finland
2013 EPIGRAT Graphene School, Slovenia
2012 Workshop on the science and applications of epitaxial graphene, Italy
2008 Int. Conf. on Electronic Materials – ICEM2008, Sydney, Australia 2008,
2007 4th Int. Conference on Spectroscopic Ellipsometry, ICSE-IV Sweden,
2006 3rd International Workshop on InN, Brazil 2006
2005 2nd Workshop on Ellipsometry, Swed. Opt. Society meeting, Sweden
more than 10 Invited Faculty Seminars at Universities in US, Asia & Europe.

Other merits: Deputy division manager at the Semiconductor Materials division since 2013, Faculty opponent and member of PhD evaluation committees in Sweden; member of the evaluation panel NT-P (Technical Physics) at the Swedish Research Council, VR 2011 & 2012, PhD thesis reviewer, Leipzig University, Germany 2012

12. Research Funding Main Applicant (co-PI to 3 more grants by VR and FCT)

- 2014 – 2018 SSF Future Research Leaders grant: THz ellipsometry of advanced materials for high-speed electronics, 10 MSEK, **PI**
- 2014 – 2017 VR Young Researcher Grant: Taming graphene for ultra-high-speed electronics: insights from novel ellipsometry techniques, 3.34 MSEK, **PI**
- 2014 – 2015 ÅForsk: Terahertz Ellipsometer: the core of a new Terahertz Materials Preparation and Analysis Center, 600 KSEK, **PI**
- 2012 – 2015 VINNOVA Vinnmer Marie Curie international qualification: THz ellipsometry and optical Hall effect: important techniques to study graphene and InN”, 2.9MSEK, **PI**
- 2011 – 2013 VR Project Grant: Free-charge carrier properties and doping mechanisms of advanced semiconductor materials for high-speed electronics, 2.5 MSEK, **PI**
- 2010 – 2013 National Science Foundation - FCT Portugal: “Free-charge carrier properties and doping mechanisms in InN-based materials” 200kEuro, **PI**
- 2008 - 2010 Part in the Linköping Linnaeus Initiative for Novel Functional Materials (LiLi-NFM), Swedish Research Council - VR, 489 kSEK/yr
- 2006 – 2009 FoAss grant by the Swedish Research Council -VR, “Physics of group-III nitride multifunctional materials and low-dimensional structures”, 3.92 MSEK, **PI**