

Mohammadreza Nematollahi

Post-doctoral researcher

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CONTACT INFORMATION

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RESEARCH EXPERIENCE

- 10/2014 – present **Post-doctoral fellowship,**
Norwegian University of Science and Technology (NTNU), Trondheim, Norway.
Supervisor: Assoc. Prof. Turid Worren Reenaas
Research on the intermediate band solar cells; study, fabrication, and characterization of potential intermediate band materials and solar cells based on doped ZnS, Si, Cu₂O, and MoO_{3-x}.
- 03/2016 – 07/2016 **Visiting scholar,**
Solar Energy Institute at Technical University of Madrid, Madrid, Spain
Characterization of the intermediate band solar cells based on ZnS:Cr in the group of Prof. Antonio Martí.

EDUCATION

- 10/2010 – 10/2014 **Ph.D., Physics,**
Norwegian University of Science and Technology (NTNU), Trondheim, Norway.
Title: Cr-doped ZnS for intermediate band solar cells
Supervisor: Assoc. Prof. Turid Worren Reenaas
Co-adviser: Prof. Ursula Gibson
Assessment committee:
- Professor Marta Castillejo, *Instituto de Química Física Rocasolano, Spanish National Research Council (CSIC), Spain*
 - Dr. Wladek Walukiewicz, *Lawrence Berkeley National Laboratory, USA*
 - Associate professor Fride Vullum-Bruer, *Department of Materials Science and Engineering, NTNU, Norway*
- 09/2007 – 02/2010 **M.Sc., Physics,** Total GPA: 17.63/20
Sharif University of Technology (SUT), Tehran, Iran
Title: The effect of metal oxides on gasochromic properties of WO₃ thin films formed by pulsed laser deposition
Supervisor: Prof. Seyed Mohammad Mahdavi
- 09/2003 – 09/2007 **B.Sc., Atomic Physics,** Total GPA: 17.30/20
Shiraz University, Shiraz, Iran

RESEARCH INTEREST

Photonic applications of materials; Fabrication and characterization of thin films and optoelectronic devices.

SKILLS AND COMPETENCES

Hands-on experience:

- Growth of metallic and semiconducting thin films: Pulsed laser deposition, RF and DC sputtering, thermal and e-beam evaporation
- Microscopy (SEM, AFM, FIB, light microscopy, and TEM data analysis)

- Spectroscopy (XPS, UPS, optical UV-VIS, Ellipsometry, EDS, and RPES using Mat-line of the synchrotron radiation ASTRID2 in Aarhus)
- Device characterization (Quantum efficiency, I-V characteristics, Electroluminescence)
- Other (XRD; 4-point probe conductivity measurement, wafer scribe, profilometer, glove box)

Other experience:

- Extensive working experience in cleanroom ISO 5 and ISO 7
- Familiar with photolithography, completed the trainings at NTNU Nanolab
- Theoretical and practical experience in design and maintenance of vacuum systems, specifically pulsed laser deposition system
- 4-point probe, wafer scribe, profilometer, glove box.

Computer skills: MATLAB, Latex, Microsoft office

SELECTED PUBLICATIONS

Journal papers

- T. Brakstad, B. R. Hope, M. Nematollahi, M. Kildemo, N. J. Podraza, K. Ghimire, T. W. Reenaas, "Ellipsometric study of the optical response of ZnS:Cr for PV applications", Appl. Surf. Sci. Accepted manuscript, (2016).
- M. Nematollahi, X. Yang, E. Seim., P.E. Vullum, R. Holmestad, U.J. Gibson, and T.W. Reenaas, "Compositional and structural properties of pulsed laser-deposited ZnS:Cr films", Appl. Phys. A-Mater, 122, (2016).
- F. Mazzola, M. Nematollahi, Z. Li, S.P. Cooil, X. Yang, T.W. Reenaas, J.W. Wells, "Resonant photoemission spectroscopy for intermediate band materials", Appl. Phys. Lett., 107, 192104 (2015).
- M. Nematollahi, X. Yang, L.M.S Aas, Z. Ghadyani, M. Kildemo, U.J. Gibson, T.W. Reenaas, "Molecular beam and pulsed laser deposition of ZnS:Cr for intermediate band solar cells", Sol. Energ. Mat. Sol. C., 141, 322-330 (2015).
- M. Nematollahi, X. Yang, U.J. Gibson, T.W. Reenaas, "Pulsed laser ablation and deposition of ZnS:Cr", Thin Solid Films, 590, 28-32 (2015).
- N. Molland, Z. Ghadyani, E.A. Karhu, S. Poggio, M. Nematollahi, M. Kildemo, T.W. Reenaas, J.J. BelBruno, U.J. Gibson, "Band-edge modification and mid-infrared absorption of co-deposited $Fe_xZn_{1-x}S$ thin films", Opt. Mater. Express, 7 (5), 1613-1620 (2015).
- A.M. Fyhn, X. Yang, M. Nematollahi, J.C. Walmsley, U.J. Gibson, "Anodic electrodeposition of $Ag_{1-x}Cu_xO$ microcrystals", J. Solid State Electrochem., 18 (1), 13-18 (2014).

Selected conference papers

- M. Nematollahi, X. Yang, E. Seim, P.E. Vullum, R. Holmestad, U.J. Gibson, and T.W. Reenaas, "Highly Cr-doped ZnS for intermediate band solar cells", In proc. of 17th International Conference on II-VI Compounds (II-VI 2015), Paris, France (2015).
- M. Nematollahi, X. Yang, U.J. Gibson, T.W. Reenaas, "XPS study of Cr:ZnS films", In proc. of 30th European Conference on Surface Science (ECOSS 30), Antalya, Turkey (2014).
- X. Yang, M. Nematollahi, U.J. Gibson, T.W. Reenaas, "Cr-doped ZnS for intermediate band solar cells", In proc. of 39th IEEE Photovoltaic Specialist Conference (PVSC 39), Tampa, Florida, USA, (2013).

Selected talks

- M. Nematollahi, K. Inzani, F. Vullum-Bruer, T. Reenaas, "Molybdenum trioxide for use in solar cells", Norwegian Solar Cell Conference, Son, Norway, (2016)
- M. Nematollahi, X. Yang, U.J. Gibson, T.W. Reenaas, "Recent progress in Cr:ZnS based intermediate band solar cells", 6th World Conference on Photovoltaic Energy Conversion (WCPEC-6), Kyoto, Japan, (2014).
- M. Nematollahi, X. Yang, U.J. Gibson, T.W. Reenaas, "Intermediate band solar cell based on Cr:ZnS", Norwegian Solar Cell Conference, Son, Norway, (2014).
- M. Nematollahi, X. Yang, U.J. Gibson, T.W. Reenaas, "Bulk intermediate band solar cell based on Cr-doped ZnS", Norwegian Solar Cell Conference, Oppdal, Norway, (2013).

TEACHING EXPERIENCE

Course coordinator/lecturer (Fall 2015), "Energy and Environmental Physics" (master level course)

TFY4300, NTNU)

Course content: The energy budget of the earth, radiation and the greenhouse effect, ozone and life, climate and weather, and climate change. Methods and the physical basis for exploitation of conventional (fossil fuels and nuclear energy) and renewable energy sources (solar water heating and solar thermal, photovoltaics, wind, bio-mass and bio-fuel, ocean waves, hydro-power, tidal and geothermal energy)

Guest lecturer (21/09 22/09, and 29/09/2016), “Solar Energy” / 6 lectures, for the course entitled “Energy and Environmental Physics” (TFY4300 – NTNU)

Guest lecturer (23/10/2015), “Solar Energy and Solar Cells” / 2 lectures, for the course entitled “Energifremtider og miljøvisjoner/Energy and environmental visions” (EP0100 – NTNU)

Guest lecturer (28/01/2015), “High Efficiency Solar Cells” / 2 lectures

Lab teacher (Fall 2008, Spring and Fall 2009) “Modern Physics Laboratory”, SUT, (rewrote lab brochure, gave short lectures and answered questions during lab sessions, prepared and graded the exams).

Teaching assistant (Spring 2006) “Introduction to Physics for Engineering Students”, Shiraz University, (Assignment coordinator)

ACADEMIC ACTIVITIES

(Co)supervising experience:

- **PhD student:** Thomas Brakstad (2015-2016)
- **Master students:** Peter Kusterle (2014), Carl Philip Heimdal (2014), Benjamin Hope (2015), Heidi Hauge (2015)

Reviewer:

- Solar Energy Materials & Solar Cells (SOLMAT) ISSN: 0927-0248
- Journal of Energy and Power Engineering ISSN: 1934-8975 (print) 1934-8983 (online)

Examiner: Examiner/opponent on M.Sc. thesis

HONOURS

- **Ranked 49th**, among more than **7534** participants in the Nationwide Graduate Entrance Exam in Physics and Nanophysics branch (Spring 2007)
- **Ranked 1st**, among Optics students of Physics Department of Shiraz University (**15** students)
- **Ranked 3rd**, in Physics Department of Shiraz University (among **52** students)
- **Admission to the School for Exceptional Talents of Iran (NODET)**(1996-2003)

LANGUAGE

English (fluent), Persian (mother tongue), Norwegian (limited)

SELECTED COURSES

- **Teaching training seminar**, NTNU, Norway (3 days – 2016)
- **Advanced Pulsed Laser Deposition of Complex Oxides**, Nanolab, University of Twente, Enschede, the Netherlands (3 days – 2011)

Selected degree courses:

- **Ph.D. (at NTNU):** Solar Photovoltaic and Nanostructures, Application of Symmetry Groups in Physics, Advanced Experimental Physics, Advanced Characterization Methods, Self-study on Laser Processing and Pulsed laser Deposition
- **M.Sc. (at SUT):** Advanced Quantum Mechanics 1&2, Advanced Solid State Physics 1, Nanomaterial Synthesis Methods, Surface Physics, Electrodynamics (Jackson), Statistical Mechanics, Advanced Laboratory 1
- **Undergraduate (Atomic field):** Spectroscopy, Laser, Vacuum Technology