

DANIEL S. LAMBERT

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PROFILE

I am a university medalist with several high quality journal publications who has recently completed my PHD, with a record of hard work, teamwork and outstanding academic results, looking to expand the knowledge of energy technologies with high quality research.

EDUCATIONAL QUALIFICATIONS

2015-2019: PHD in PHD in Photovoltaic and Renewable energy Engineering (material science focused) at the University of New South Wales

PHD Thesis title: Ab-initio modelling of the defect chemistry of MoO₃ and Si: Applications for carrier selective contacts of solar cells

Over the course of my PHD research, I developed extensive skills in ab-initio chemical modelling, in particular density functional theory, for photovoltaic selective contact materials. This was used to examine thermodynamics and kinetics of defects in MoO₃ and Si, predicting the concentration of these defects under varied temperatures and oxygen partial pressures fabrication conditions, and to find the resulting effect on the electronic structure of the material. This research resulted in the publication of three journal papers in high impact journals, with more journal papers under preparation.

In the course of this PHD I developed several methodological improvements for ab-initio calculations and analysis, such as a new method for determining the chemical potential for multiple impurity formation energies, and a scaled hybrid method for calculating the density of states of materials in high quality computational configurations with significantly reduced computation time.

2010-2014 : Bachelors double degree of Physics combined with Engineering under the Photovoltaics and Solar Energy plan, with 1st class honours and the University medal at the University of New South Wales

In my undergraduate degree I achieved a high degree of academic achievement. Over the ten semesters of my undergraduate degree I achieved Weighted Average Mark (WAM) of 86.4 out of 100 (High Distinction average), leading to me receiving four engineering Deans awards and the University Medal.

As part of the 'Taste of Research' scholarship in 2012, I investigated the preparation of anodized aluminium oxide as a potential photovoltaic contact material for point contact metallization. For my undergraduate thesis, I investigated the optical modelling of anodized aluminium oxide in order to improve the characterization of these layers. This involved the characterization of these samples using ellipsometry and building a corresponding optical ellipsometric model, as well as a theoretical FDTD model of these structures with unique nanoscale pores.

AWARDS

I have received numerous awards for outstanding academic achievement, reflecting my intelligence, commitment to knowledge and hard work.

- Research Training Program award (2015-2018) (\$95k)
- UNSW Research Excellence Award (2015-2018) (\$35k)
- Engineering Supplementary Award (ESA) (2015-2018) (\$25k)
- **University Medal** (2014), for highest mark in degree
- **Faculty of Engineering Deans Awards** (four awards): (2011, 2012,2013,2014), for top 2% of student in degree each year
- Taste of research scholarship (2012) (\$5k)
- Suntastic Project Prize (2011) (\$200)
- Faculty of Science Dean's List (2010)
- Ian Somerville scholarship (2010) (\$10k)

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- Premiers Award for All Around Excellence (2009)
- Top of School, Software Design and Development(2009, 2008)
- Third in School (overall) (2008)
- Academic Achievement Award (2007,2008,2009)

RESEARCH SKILLS

I am deeply skilled in ab-initio density functional theory modelling, in particular the modelling of defect chemistry, electronic structures, and defect diffusion pathways. I have developed new methodological techniques over the course of my research, such as a technique for scaling simulations to be run in different DFT functionals and a technique for directly comparing multiple oxide sources for solubility calculations. I have published three first-author papers in high-impact journals and have presented at three research conferences I also have experience in the laboratory skills of wet chemical etching, and anodization techniques, as well as the characterization skills of ellipsometry and spectrophotometry.

I have extensive experience in the use of high performance computing for materials simulations. I am proficient in the programming languages Python, C and Labview, and have also worked with Perl, Bash, Octave, Matlab and visual basic. I developed the software interface for the custom controlling of current-voltage sweeps in an environmental chamber. I received a high distinction in the Higher Computing 1 course at UNSW, and have completed a Stanford course on machine learning. I am also familiar with many different software packages, such as VASP, LAMMPS, Origin pro, Inkscape, Microsoft excel, WVASE, VESTA, Lumerical FDTD, Microsoft word and lateX.

LIST OF PUBLICATIONS

Journal papers

Lambert, D. S., Murphy, S. T., Lennon, A., & Burr, P. A. (2017). "Formation of intrinsic and silicon defects in MoO₃ under varied oxygen partial pressure and temperature conditions: an ab initio DFT investigation." *RSC Advances*, 7(85), 53810-53821.

Lambert, D. S., Lennon, A., & Burr, P. A. (2018). "Extrinsic Defects in Crystalline MoO₃: Solubility and Effect on the Electronic Structure." *The Journal of Physical Chemistry C* 122(48): 27241-27249.

Lambert, D. S., Lennon, A., & Burr, P. A. (2020). "Mechanism of Mo contamination in Si" *Physical Review materials*, 4, 025403.

Md. Anower Hossain, Tian Zhang, Yahya Zakaria, Daniel Lambert, Patrick A Burr, Sergey N Rashkeev, Amir Abdallah, and Bram Hoex "Doped Nickel Oxide Carrier-Selective Contact for Silicon Solar Cells," in *IEEE Journal of Photovoltaics*

Conference presentations:

Lambert, D. S., et al. (2018). "Tailoring of Electrical Properties of MoO_x Carrier Selective Contacts in Silicon Solar Cells using Density Functional Theory Calculations"(presentation) Future energy EF3 conference 2018

Lambert, D. S., et al. (2018). "Tailoring the electrical properties of MoO₃ using DFT simulations"(presentation) TMS conference 2018

Lambert, D. S., et al. (2018). "Modelling the Defect Chemistry of MoO_{3-x} Carrier-Selective Contact Layers for Photovoltaic Devices Under Varied Preparation Conditions Using DFT Calculations"(poster) MRS Spring meeting 2018

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EMPLOYMENT EXPERIENCE

2019: Research assistant, UNSW

Until the end of 2019 I was employed as a part-time research assistant at the university of new south wales. This role involved writing up my PHD research into high quality journal papers, as well advising and assisting other researchers with density functional theory simulations and analysis.

2015: Tutor for Solar manufacturing course, UNSW

I was employed as a tutor at the University of New south wales for a course in solar cell manufacturing, where I helped engage students to learn about the process of solar cell manufacturing.

2017: Lecture video recorder, UNSW

I was employed as a lecture recorder for a course in nuclear engineering, as part of a team trialing a new lecture recording system involving live switching between camera output and lecture slides.

2010-2017: Performer, UNSW circus society

For a period of 5 years I have performed at paid circus gigs for the UNSW circus society, involving the organization of circus shows for clients such as an army barracks social. I have also performed in sold-out circus shows in 2013, 2015, and 2017, which required dedicated rehearsal and significant teamwork.

OTHER EXPERIENCE

2012- 2017: **Organiser**, Australian Youth Climate Coalition

I have been an active volunteer for the Australian Youth Climate Coalition for over a decade. In 2012 I was one of the organisers of the “Vinnies Goes Green” charity event with the goal of making St Vincent de Paul stores more sustainable. More than 200 people attended and we raised over \$3,000, making the campaign a huge success. I have also volunteered with phonebanking and recruitment.

2014-2015, 2018: **Secretary**, UNSW circus society

2017: **Treasurer**, UNSW circus society

I was on the executive of the circus society for over four years. As secretary I managed correspondence with a range of clients for which we deployed club members for professional paid circus gigs, and as treasurer I helped manage the finances arising from these activities. While I was in the executive, club membership grew from a group of five to over fifty active members.

2011: **Group leader**, Photovoltaic second year project

I was the group leader for the photovoltaic second year project at UNSW. Over a two semester period, we constructed a solar concentrator and a buck converter capable of running a small motor. By using inspiration, ingenuity and communication, and despite the differences in cultural background, our team performed extremely well. As a result I received the Suntastic Project Prize.

REFERENCES

Patrick Burr:

PHD supervisor/ employer

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