

EMPLOYMENT

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EDUCATION

Victoria University of Wellington, Wellington, NZ

PhD, School of Chemical and Physical Sciences, submitted March 2009

Topic: Electronic structure of the rare earth nitrides*Advisor:* Dr. Ben Ruck

BSc (HONS), Physics, November 2005

PROFESSIONAL
EXPERIENCE**Experimental condensed matter physics**

I have experience growing nitride thin films using thermal evaporation and pulsed laser deposition; with ultra-high vacuum systems and cryogenics down to liquid helium temperatures; and with the following characterization techniques:

Structural - x-ray diffraction and reflection high energy electron diffraction

Magnetization - SQUID magnetometry and magneto-resistance

Optical - transmission, reflectance and ellipsometry

Transport - high- and low-impedance temperature dependent measurements

Theoretical condensed matter physics

I have twice visited Professor Walter Lambrecht at Case Western Reserve University in Cleveland, Ohio. There I used advanced density functional theory [frameworks](#), based around the LSDA+U method, to investigate the electronic structure of magnetic semiconducting nitrides.

I have experience with the calculation of atomic energy levels and multiplet spectra of transition metal and rare earth atoms using [Hartree-Fock codes](#).

Synchrotron based experiments

I have extensive experience with experiments using soft x-ray synchrotron radiation on beamlines X1B and U4B at the National Synchrotron Light Source at Brookhaven National Laboratory in NY, and on beamline 5II at Maxlab in Upsala, Sweden. In particular I have used the following techniques to probe the electronic structure of novel semiconducting materials:

NEXAFS - near-edge x-ray absorption fine structure

RIXS/RXES - resonant inelastic x-ray spectroscopy

XPS - x-ray photoemission spectroscopy

XMCD - x-ray magnetic circular dichroism

Communication

I have presented my work at many conferences. Highlights are two talks at the American Physical Society March meeting in 2007, a talk at the Materials Research Society (MRS) Fall meeting in November 2007, and a talk at the MRS Australia meeting in July 2008.

In November 2008 I won 3rd prize at the MacDiarmid Institute student and post-doc symposium for my presentation on synchrotrons.

PUBLICATIONS

13. **A. R. H. Preston**, H. J. Trodahl, B. J. Ruck, L. F. J. Piper, K. E. Smith, J. E. Downes, W. R. L. Lambrecht (in preparation)
Electronic structure of GdN from x-ray absorption and emission spectroscopy
12. *Electrical and optical properties of hafnium nitride thin films* (in preparation)
11. *Growth and properties of epitaxial GdN* (submitted to Appl. Phys. Lett.)
10. *Magnetic properties of ErN semiconducting films* (submitted to Phys. Rev. B)
9. Phys. Rev. B **79**, 054301 (2009)
8. J. Appl. Phys. **104**, 103710 (2008)
7. Phys. Rev. B **78**, 174406 (2008)
6. **A. R. H. Preston**, B. J. Ruck, L. F. J. Piper, A. DeMasi, K. E. Smith, A. Schleife, F. Fuchs, F. Bechstedt, J. Chai, and S. M. Durbin
Band structure of ZnO from resonant x-ray emission spectroscopy
Phys. Rev. B **78**, 155114 (2008)
5. H. J. Trodahl, **A. R. H. Preston**, J. Zhong, B. J. Ruck, N. M. Strickland, C. Mitra, W. R. L. Lambrecht
Ferromagnetic redshift of the optical gap in GdN
Phys. Rev. B **76**, 085211 (2007)
4. **A. R. H. Preston**, S. Granville, D. H. Housden, B. Ludbrook, B. J. Ruck, H. J. Trodahl, A. Bittar, G. V. M. Williams, J. E. Downes, A. DeMasi, Y. Zhang, K. E. Smith, W. R. L. Lambrecht
Comparison between experiment and calculated band structures for DyN and SmN
Phys. Rev. B **76**, 245120 (2007)
3. J. Mater. Sci.: Mater. Electron. **18**, 107 (2007)
2. Phys. Rev. B **73**, 235335 (2006)
1. J. Appl. Phys. **99**, 034312 (2006)

REFEREES

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