

Bryce Sydney Richards

Citizen: New Zealand & Australian **Permanent Resident:** U.K.

Email: B.S.Richards@hw.ac.uk

- Education**
- University of New South Wales, Sydney, Australia**
Grad. Cert. in University Learning and Teaching (Jul 2002 – Nov 2005)
- University of New South Wales, Sydney, Australia**
PhD (Photovoltaic Engineering) (Mar 1998 – Apr 2002)
- Novel uses of TiO₂ films in silicon photovoltaics, including single-material double-layer antireflection coatings, and surface passivation techniques.
- University of New South Wales, Sydney, Australia**
MEngSc (Electrical Engineering) (Mar 1996 – Feb 1998)
- Optical characterisation of sputtered silicon thin films for PV applications.
- Victoria University of Wellington, Wellington, New Zealand**
BSc (Physics) (1990 – 1991, 1994)
- Bachelor of Science (BSc), majoring in physics.
- Academic Experience**
- Heriot-Watt University (HWU), Edinburgh, Scotland**
Professor (Sep 2008 –) *Reader* (Aug 2006 –) *Lecturer* (Jul 2006)
- Research: i) Application of luminescent materials to photovoltaics: a) luminescent down-shifting; b) luminescent solar concentrators (LSC); c) up- and down-conversion; ii) photonic crystal layers for photon management; iii) High-efficiency Si solar cells; iv) PV- and wind-powered water treatment systems.
 - Teaching: Demand Management and Energy Storage; Advanced Renewable Energy Engineering.
 - **Director** of Scottish Institute for Solar Energy Research (SISER), HWU (Dec 2008 –).
 - Deputy-Director of Joint Research Institute in Energy (Sep 2007 –).
- Australian National University (ANU), Canberra, Australia**
ARC Research Fellow (Mar 2005 – Jul 2006)
- Research areas: i) Surface passivation with dielectric thin films; ii) Luminescent solar concentrators; iii) PV-powered desalination systems.
- University of New South Wales (UNSW), Sydney, Australia**
Lecturer (25%) / Postdoctoral Fellow (75%) (Apr 2002 – Mar 2005)
- Developed, taught and/or coordinated the courses SOLA5050 Renewable Energy Policy, SOLA5051 Life Cycle Assessment, SOLA5053 Wind Energy Converters.
 - Research areas: i) next-generation PV materials; ii) up- and down-conversion of the solar spectrum; iii) LSCs; and iv) energy payback times.
- Conference Organising and Session Chairing**
- Program committee member for SPIE Europe - Photonics for Solar Energy Systems (2012 –).
 - Organising committee member for PVSAT - the UK PV conference (2007 –).
 - Host for PVSAT7 - to be held in Edinburgh 6–8 Apr 2011.
 - Scientific committee member for European Photovoltaic Solar Energy Conference (2009 –).
 - Chair or co-chair of photovoltaic sessions at IMRC Conference, Mexico (Aug 2005), ANZSES Conference, Newcastle, Australia (Dec 2002) and IEEE Photovoltaic Specialists Conf., New Orleans (May 2002).

Academic Experience

Boards

- Managing Editor of *Progress in Photovoltaics* (PIP) (2006–2009).
- Technical Advisory Board member, Translucent Inc, USA (2008–2010).

Reviewing

- Reviewer for: Nature Photonics, Applied Physics Letters, Journal of Applied Physics, Progress in Photovoltaics, Solar Energy Materials & Solar Cells, Optics Letters, Optics Express, JOSA B, Thin Solid Films, Electrochemical and Solid-State Letters, International Journal of Hydrogen Energy, Surface and Interface Analysis, Journal of Membrane Science, Desalination.
- Grant reviewer for: EPSRC, Royal Society, Leverhulme Trust, British Council, ARC (Australia), NSF (Swiss), DoE (USA), NRF (Singapore).

Research Funding Awarded - Research Council

- EPSRC-CAS grant together with Fujian Institute of Research on the Structure of Matter to investigate Luminescent Lanthanide Layers for Enhanced Photovoltaic Performance (L³EAP²) (HWU budget £631,000 over 3 years) (Feb 2011).
- TSB Technology Programme grant together with NaREC (UK) to develop a 20% efficient Si solar cell (HWU budget £365,000 over 3 years) (Oct 07).
- EPSRC Feasibility Study grant together with Drs. Robertson and Jones (Univ. Edinburgh), Lucite and NaREC (HWU budget £161,000 over 1.5 years) to investigate novel organic dyes for luminescent solar concentrators (June 2007).
- ARC Linkage International (A\$10,000 over two years) together with Prof. Tiwari at ETH Zürich, Switzerland investigating potential of luminescent down-shifting for CdTe and CIGS solar cells (May 2006).
- ARC Linkage (A\$516,000 over 3 years) together with SierraTherm Production Furnaces (CA, USA) and SunPower Corp. (CA, USA) (Mar 2005).
- ARC Linkage (A\$330,000 over 3 years) together with Dr. Schäfer (Univ. Wollongong) and Mono-Pumps (Melbourne) to develop the PV-powered desalination system (May 2003).

Research Funding Awarded - Other

- Energy Technology Partnership (ETP) studentship to evaluate renewable technologies for sustainable autonomous operation of small remote water treatment systems with Drinking Water Quality Regulator (Scotland) and Univ. Edinburgh (HWU budget £75,000 over 3.5 years) (Oct 2011).
- ETP studentship to forward the luminescent solar concentrator technology with Teknova (Norway) and Univ. Edinburgh (HWU budget £75,000 over 3.5 years) (Sep 2011).
- Leverhulme Trust Research Grant to investigate the aesthetic integration of PV into buildings (HWU budget £239,000 over 3 years) (Oct 2010).
- EU FP7 grant NanoSpec to investigate up-conversion for concentrating silicon solar cells (HWU budget €576,000 over 3 years) (Apr 2010).
- Italian Government grant with Univ. Ca' Foscari (Venice, Italy) and XGroup S.p.A. (Italy) to investigate spectral conversion for mc-Si solar cells (HWU budget €14,000 over 1 year) (Jan 2010).
- TSB SPARK award and MoD sub-contract together with Trackdale (UK) to investigate an infrared harvesting PV device (HWU budget £5,000 over 1 month and £10,000 over 2 months, respectively) (Apr 2009).
- Scottish Enterprise Proof of Concept grant together with Dr. Schäfer (Univ. Edinburgh) to develop a novel renewable energy powered desalination system (CI, HWU budget £124,000 - over 2 years) (Feb 2007).
- Royal Society Wolfson Laboratory Refurbishment grant to develop renewable energy test site at HWU (£56,000 + HWU matching funding) (May 2007).

Research Funding Awarded - Other (continued)

- UNESCO Scotland grant - Feasibility study of solar-powered membrane filtration technology for the purification of contaminated water in Africa (CI, £14,000 over 1 year) (UoE, HWU and Dundee).
- Royal Society Brian Mercer Feasibility Award (PI, £30,000 over 1 year) to develop coloured BIPV windows (Feb 2007)
- Industry grant (PI, €350,000 over 3 years) from BASF (Germany) to develop NIR-harvesting LSCs (Jun 2005).
- Solar-powered desalination system field trials in the Australian outback, A\$21,800 sponsorship from ANU, local industry, state and federal government (Sep 2005).
- UNSW Research Grant (A\$15,000) for a low-escape-cone loss LSC (Dec 2003).
- Received A\$40,000 (UNSW RIBG grant) to design and fabricate a PV-powered water treatment system for remote areas (Jun 2001).

**Prizes,
Awards and
Scholarships**

- Winner of a Mondialogo Engineering Award - a partnership between DaimlerChrysler and UNESCO - including US\$18000 prize money, May 2005, Berlin, Germany (www2.mondialogo.org/mea/winners/?&L=en).
- Best paper prize at PVSAT4 Conference, Bath, U.K. 2008.
- Received 2nd prize in the Water category at the Energy Globe Awards 2003 in Linz, Austria (www.energyglobe.at).
- CSIRO/ATSE prize to attend World Renewable Energy Congress VII (Cologne, Germany) and represent Australia at the Australia-European workshop (2002).

**Professional
Experience**

Photovoltaic Engineering Consultant (Mar 2002 –)

- Performed consulting for Photon Solutions (UK), AdvanceSis (UK), Bookham Technology (UK), SunPower Corporation (USA), Amonix (USA), Translucent (USA), Dow Corning (USA), Varian Semiconductor (USA).

Eurosolare S.p.A., Nettuno, Italy

Research Engineer (Jul 1998, Jun 2000)

- Responsible for collaborative work for an ARC SPIRT grant between UNSW and Italian PV manufacturer Eurosolare S.p.A., and contracted to advise on implementation of buried-contact solar cell technology on a pilot production line.

University of New South Wales, Sydney, Australia

Research Engineer (Feb 1999 – Apr 1999)

- Team member responsible for technology transfer of the buried-contact solar cell technology from UNSW to visiting researchers from Eurosolare S.p.A.

Research Assistant (Nov 1996 – Feb 1998)

- Contracted half-time to Pacific Solar, performing optical and electrical characterisation of thin film silicon solar cells on glass.

Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany

Visiting Fellow, Dept. of Prof. Manuel Cardona (Jan 1995 – Dec 1995)

- Tasks included designing and constructing a computer-controlled Raman microscope, and then measuring the optical properties of laser crystallised amorphous silicon films and GaAs/AlGaAs quantum wells.

Membership

IEEE (Institute for Electrical and Electronic Engineers - Senior Member), ISES (Intl. Solar Energy Society), OSA (Optical Society of America).

Languages

English (native), German (nearly fluent).

Publications

Patents

- P1 **B.S. Richards**, A. Boehm, A. Grimm “Photovoltaic modules with improved quantum efficiency” (WO/2008/110567) (Senior inventor).

Books, Book Chapters, Conference Proceedings and Theses

- B1 **B.S. Richards** (1998) “Optical characterisation of sputtered silicon thin films for photovoltaic applications”, Master of Engineering Science thesis, UNSW, Feb 1998 (Senior author).
- B2 **B.S. Richards** (2002) “Novel Uses of Titanium Dioxide for Silicon Solar Cells”, PhD thesis, Centre for Photovoltaic Engineering (UNSW), ISBN 0733419712 (Senior author).
- B3 **B.S. Richards**, M.A. Green (2005) “Photovoltaic Cells” entry for Encyclopaedia of Biomedical Engineering, Wiley, 12pp (Senior author).
- B4 **B.S. Richards**, A. Shalav (2007) “Photovoltaic Devices” chapter for The Handbook of Photonics (2nd Ed.), eds. M.C. Gupta and J. Ballato, CRC Press, Boca Raton, FL, USA (invited) (Senior author).
- B5 **B.S. Richards**, A.I. Schäfer, (Editors) (2008) “Proc. of International Workshop in Water and Sanitation in International Development and Disaster Relief”, University of Edinburgh and Heriot-Watt University, ISBN 978-0-9557497-1-1 (Senior editor).
- B6 **B.S. Richards**, A.I. Schäfer (2009) “Renewable Energy Powered Water Treatment Systems” chapter for Sustainable Water for the Future Water Recycling versus Desalination, Elsevier Science, (invited) (Senior author).
- B7 **B.S. Richards**, L. Masson, A.I. Schäfer (2009) “Impact of Feedwater Salinity on Energy Requirements of a Small-Scale Membrane Filtration System”, chapter for Appropriate Technologies for Environmental Protection in the Developing World, ed. Y. Yanful, Springer Science + Business Media, pp. 123 – 138.

Journal Articles

- J1 P. Etchegoin, A. Fainstein, A.A. Sirenko, B. Koopmans, **B.S. Richards**, P.V. Santos, M. Cardona, K. Totenmeyer, K. Eberl (1996) *Optics of multiple quantum wells uniaxially stressed along the growth axis*, Physical Review B, 53(20), 13662–13671.
- J2 D. Toet, B. Koopmans, P.V. Santos, R.B. Bergmann, **B.S. Richards** (1996) *Growth of polycrystalline silicon on glass by selective laser-induced nucleation*, Appl. Phys. Letters, 69(24), 3719–3721.
- J3 B. Koopmans, **B.S. Richards**, P.V. Santos, K. Eberl, M. Cardona (1996) *In-plane anisotropy of GaAs/AlAs multiple quantum wells probed by microscopic reflectance difference spectroscopy*, Applied Physics Letters, 69(6), 782–784.
- J4 D. Toet, B. Koopmans, R.B. Bergmann, **B.S. Richards**, P.V. Santos, M. Albrecht, J. Krinke (1997) *Large area polycrystalline silicon thin films grown by laser-induced nucleation and solid phase crystallization*, Thin Solid Films, 296, 49–52.
- J5 C.B. Honsberg, J.E. Cotter, K.R. McIntosh, S. Pritchard, **B.S. Richards**, S.R. Wenham, (1999), *Design strategies for commercial solar cells using the buried contact technology*, IEEE Transactions on Electron Devices, 46(10), 1984–1992.
- J6 **B.S. Richards**, J.E. Cotter, C.B. Honsberg, (2002) *Enhancing the surface passivation of TiO₂ coated silicon wafers*, Applied Physics Letters, 80(7), 1123–1125.

Publications

Journal Articles cont.

- J7 **B.S. Richards**, A.I. Schäfer (2002) *Design Considerations for a Solar-powered Desalination System for Remote Communities in Australia*, *Desalination*, 144, 193–199.
- J8 **B.S. Richards**, S.F. Rowlands, C.B. Honsberg, J.E. Cotter (2003) *TiO₂ DLAR Coatings for Planar Silicon Solar Cells*, *Progress in Photovoltaics*, 11(1), 27–32.
- J9 **B.S. Richards** (2003) *Single-Material TiO₂ Double-Layer Antireflection Coatings*, *Solar Energy Materials & Solar Cells*, 79(3), 369–390.
- J10 **B.S. Richards**, A.I. Schäfer (2003) *Photovoltaic-powered Desalination System for Remote Australian Communities*, *Renewable Energy*, 28, 2013–2022.
- J11 **B.S. Richards**, S.F. Rowlands, A. Ueranatasun, J.E. Cotter, C.B. Honsberg (2004) *Reducing the Production Costs of Buried-Contact Solar Cells using Titanium Dioxide Thin Films*, *Solar Energy*, 76(1-3): 269–276.
- J12 **B.S. Richards**, A. Lambertz, A.B. Sproul (2004) *Determination of the Optical Properties of Non-Uniformly Thick Sputtered Non-Hydrogenated Silicon Thin Films on Glass*, *Thin Solid Films*, 460 : 247–255.
- J13 **B.S. Richards**, S.R. Richards, M.B. Boreland, D.N. Jamieson (2004) *High Temperature Processing of TiO₂ Thin Films for Application in Silicon Solar Cells*, *Journal of Vacuum Science & Technology A*, 22(2): 339–348.
- J14 **B.S. Richards** (2004) *Comparison of Dielectric Coatings for Buried-Contact Solar Cells: A Review*, *Progress in Photovoltaics* 12, 253–281.
- J15 C. Remy, A.I. Schäfer, **B.S. Richards** (2004) *Performance of a small solar-powered hybrid membrane system for remote communities under varying feed-water salinities*, *Water Science and Technology: Water Supply*, 4(56), 233–243.
- J16 A. Shalav, **B.S. Richards**, T. Trupke, K.W. Krämer, H.U. Güdel (2005) *The application of NaYF₄:Er³⁺ up-converting phosphors for enhanced near-infrared silicon solar cell response*, *Applied Physics Letters*, 86, 013505.
- J17 **B.S. Richards**, A. Shalav (2005) *The Role of Polymers in the Luminescence Conversion of Sunlight for Enhanced Solar Cell Performance*, *Synthetic Metals*, 154, 61–64.
- J18 **B.S. Richards**, N.T.P. Huong, A. Crosky (2005) *Highly Porous Nanocluster TiO₂ Films Deposited using APCVD in an Excess of Water Vapour*, *Journal of the Electrochemical Society*, 152(7), F71–F74.
- J19 L. Masson, **B.S. Richards**, A.I. Schäfer (2005) *System Design and Performance Testing of a Hybrid Membrane Photovoltaic Desalination System*, *Desalination*, 179(1-3), 51–59.
- J20 A.I. Schäfer, **B.S. Richards** (2005) *Testing of a Hybrid Membrane System for Groundwater Desalination in an Australian National Park*, *Desalination*, 183, 55–62.
- J21 A.I. Schäfer, A. Broeckmann, **B.S. Richards** (2005) *Membranes and Renewable Energy - A new Era of Sustainable Development for Developing Countries*, *Membrane Technology*, November issue, 6–10.
- J22 **B.S. Richards** (2006) *Luminescent Layers for Enhanced Silicon Solar Cell Performance: Down-Conversion*, *Solar Energy Materials & Solar Cells*, 90, 1189–1207.

Publications

Journal Articles cont.

- J23 G. Conibeer, M. Green, R. Corkish, Y. Cho, E.-C. Cho, C.-W. Jiang, T. Fangsuwannarak, E. Pink, Y. Huang, T. Puzzer, T. Trupke, **B. Richards**, A. Shalav, K.-L. Lin (2006) *Silicon nanostructures for third generation photovoltaic solar cells*, *Thin Solid Films*, 511–512: 654–662.
- J24 **B.S. Richards** (2006) *Enhancing the performance of silicon solar cells via the application of passive luminescence conversion layers*, *Solar Energy Materials & Solar Cells*, 90: 2329–2337.
- J25 **B.S. Richards**, M.E. Watt (2007) *Dispelling a Myth of Photovoltaics via the Adoption of a New Net Energy Indicator*, *Renewable and Sustainable Energy Reviews*, 11(1), 162–172.
- J26 M. Ionescu, **B. Richards**, K. McIntosh, R. Siegele, E. Stelcer, O. Hawas, D. Cohen, T. Chandra (2006) *Hydrogen measurements in $\text{SiN}_x\text{:H/Si}$ thin films by ERDA*, *Materials Science Forum*, 539–543, 3551–3556.
- J27 T. Trupke, A. Shalav, **B.S. Richards**, P. Würfel, M.A. Green (2006) *Efficiency enhancement of solar cells by luminescent up-conversion of sunlight*, *Solar Energy Materials & Solar Cells*, 90(18–19): 3327–3338.
- J28 **B.S. Richards**, G.J. Conibeer, *A Comparison of Hydrogen Storage Technologies for Solar-Powered Stand Alone Power Supplies: A Photovoltaic System Sizing Approach*, *International Journal of Hydrogen Energy*, 32(14): 2712–2718.
- J29 **B.S. Richards**, K.R. McIntosh (2007) *Overcoming the Poor Short-Wavelength Spectral Response of CdS/CdTe Photovoltaic Modules via Luminescence Down-Shifting: Ray-Tracing Simulations*, *Progress in Photovoltaics*, 15(1): 27–34.
- J30 G.J. Conibeer, **B.S. Richards** *A comparison of PV/electrolyser and photoelectrolytic technologies for use in solar to hydrogen energy storage systems*, *International Journal of Hydrogen Energy*, 32(14): 2703–2711.
- J31 A.I. Schäfer, **B.S. Richards** (2007) *From Concept to Commercialization: Student Learning in a Sustainable Engineering Innovation Project*, *European Journal of Engineering Education*, 32(2): 1–23.
- J32 **B.S. Richards**, A. Shalav (2007) *Up-Conversion for Photovoltaics: Enhancing the Near Infrared Spectral Response of Silicon Solar Cells*, *IEEE Transactions on Electron Devices*, 54(10): 2679–2684.
- J33 A.I. Schäfer, A. Broeckmann, **B.S. Richards** (2007) *Renewable energy powered membrane technology. 1. Development and characterization of a photovoltaic hybrid membrane system*, *Environmental Science & Technology*, 41: 998–1003.
- J34 A. Shalav, **B.S. Richards**, M.A. Green (2007) *Luminescent layers for enhanced silicon solar cell performance: Up-conversion*, *Solar Energy Materials & Solar Cells*, 91(9): 829–842.
- J35 K.R. McIntosh, N. Yamada, **B.S. Richards** (2007) *Theoretical Comparison of Cylindrical and Planar Luminescent Solar Concentrators*, *Applied Physics B*, 88(2): 285–290.
- J36 P. Corbett, S. Kerr, **B. Richards**, J. Side, D. Davies, *Petroleum industry and renewables*, *First Break*, 25: 11–17.
- J37 **B.S. Richards**, D.P.S. Capão, A.I. Schäfer (2008) *Renewable energy powered membrane technology. 2. The effect of energy fluctuations on performance of a photovoltaic hybrid membrane system*, *Environmental Science & Technology* 42: 4563–4569.

Publications

Journal Articles cont.

- J38 B.B. Paudyal, K.R. McIntosh, D.H. Macdonald, **B.S. Richards**, R.A. Sinton (2008) *The implementation of temperature control to an inductive-coil photo-conductance instrument for the range of 0 to 230° C*, Progress in Photovoltaics 16(7): 609–613.
- J39 B.C. Rowan, L.R. Wilson, **B.S. Richards** (2008) *Advanced material concepts for luminescent solar concentrators*, IEEE Journal of Selected Topics in Quantum Electronics 14(5): 1312–1322 (Invited paper).
- J40 M.G. Debije, P.P.C. Verbunt, B.C. Rowan, **B.S. Richards**, T. Hoeks (2008) *Measured surface loss from luminescent solar concentrator waveguides*, Applied Optics 47(36): 6763–6768.
- J41 L.R. Wilson, **B.S. Richards** (2009) *Measurement method for photoluminescent quantum yields of fluorescent organic dyes in polymethyl methacrylate for luminescent solar concentrators*, Applied Optics 48(2): 212–220.
- J42 K.R. McIntosh, G. Lau, J.N. Cotsell, K. Hanton, D.L. Btzner, F. Bettioli, **B.S. Richards** (2009) *Increase in external quantum efficiency of encapsulated silicon solar cells from a luminescent down-shifting layer*, Progress in Photovoltaics 17: 191–197.
- J43 E.K. Klampaftis, D. Ross, **B.S. Richards** (2009) *Enhancing the performance of solar cells via luminescent down-shifting of the incident spectrum: A review*, Solar Energy Materials and Solar Cells Volume 93: 1182–1194.
- J44 O. Moudam, B.C. Rowan, M. Alamiry, P. Richardson, **B.S. Richards**, A. Jones, N. Robertson (2009) *Europium complexes with high fluorescence quantum yield in solution and in PMMA*, Chemical Communications 2009, 6649–6651.
- J45 A.I. Schäfer, H.M.A. Rossiter, P.A. Owusu, **B.S. Richards**, E. Awuah (2010) *Physico-Chemical Water Quality in Ghana: Prospects for Water Supply Technology Implementation*, Desalination 251: 193–203.
- J46 L.A. Richards, **B.S. Richards**, H.M.A. Rossiter, A.I. Schäfer (2010) *Impact of Speciation on Fluoride, Arsenic and Magnesium Retention by Nanofiltration - Reverse Osmosis in Remote Australian Communities*, Desalination 251: 177–183.
- J47 G.L. Park, **B.S. Richards**, A.I. Schäfer (2010) *Potential of Wind-Powered Renewable Energy Membrane Systems for Ghana*, Desalination 251: 169–176.
- J48 A. De Munari, D.P.S. Capão, **B.S. Richards**, A.I. Schäfer (2010) *Application of Solar-Powered Desalination in a Remote Town in South Australia*, Desalination 251: 72–82.
- J49 L.R. Wilson, B.C. Rowan, N. Robertson, O. Moudam, A.C. Jones, **B.S. Richards** (2010) *Characterization and reduction of reabsorption losses in luminescent solar concentrators*, Applied Optics 49(9): 1651–1661.
- J50 P. Vaqueiro, M.L. Romero, B.C. Rowan, **B.S. Richards** (2010) *Helical and layered coordination polymers containing gallium-sulphide supertetrahedral clusters*, Chem. Eur. J. 16(15): 4462–4465.
- J51 E.K. Klampaftis, **B.S. Richards** (2011) *Improvement in multi-crystalline silicon solar cell efficiency via addition of luminescent material to EVA encapsulation layer*, Progress in Photovoltaics 19(3): 345–351.

Publications

Journal Articles cont.

- J52 M.G. Debije, P.P.C. Verbunt, P.J. Nadkarni, S. Velate, K. Bhaumik, S. Nedumbamana, B.C. Rowan, **B.S. Richards**, T.L. Hoeks (2011) *A Promising Fluorescent Dye for Solar Energy Conversion Based on a Perylene Perinone*, Applied Optics 50(2): 163–169.
- J53 L.A. Richards, **B.S. Richards**, A.I. Schäfer (2011) *Renewable energy powered membrane technology: Salt and inorganic contaminant removal by nanofiltration/reverse osmosis*, Journal of Membrane Science 369(1-2): 188–195.
- J54 G.L. Park, A.I. Schäfer, **B.S. Richards** (2011) *Renewable energy powered membrane technology: The effect of wind speed fluctuations on the performance of a wind-powered membrane system for brackish water desalination*, Journal of Membrane Science 370(1-2): 34–44.
- J55 E.K. Klampaftis, **B.S. Richards** (2011) *Luminescent Encapsulation Layers for Multicrystalline Silicon PV Modules*, Photovoltaics International 11th edition: 104–109.
- J56 N. Sarmah, **B.S. Richards**, T.K. Mallick (2011) *Evaluation and Optimisation of the Optical Performance of Low-Concentrating Dielectric Compound Parabolic Concentrator Using Ray-Tracing Methods*, Applied Optics 50(19): 3303–3310.
- J57 E.K. Klampaftis, M. Congiu, N. Robertson, **B.S. Richards** (2011) *Luminescent EVA Encapsulation Layers for Enhancing the Short Wavelength Spectral Response and Efficiency of Silicon PV Modules*, IEEE Journal of Photovoltaics 1(1) 29–36.
- J58 M. Bortoluzzi, G. Paolucci, S. Polizzi, L. Bellotto, F. Enrichi, S. Ciorba, **B.S. Richards** (2011) *Photoluminescence Studies on Europium-based Scorpionate Complex*, Inorganic Chemistry Communications, doi:10.1016/j.inoche.2011.08.004.
- J59 G.L. Park, A.I. Schäfer, **B.S. Richards** (2011) *Renewable Energy Powered Membrane Technology: The Effect of Intermittent Operation on a Wind-Powered Membrane System for Brackish Water Desalination*, Water Science & Technology (accepted for publication).
- J60 L.A. Richards, **B.S. Richards**, A.I. Schäfer (2011) *Renewable Energy Powered Membrane Systems: Inorganic Contaminant Removal from Australian Groundwaters*, Membrane Water Treatment (accepted for publication).
- J61 G. Kocher-Oberlehner, M. Bardosova, J. McGrath, M. Pemble, **B.S. Richards** (2011) *Planar colloidal photonic crystal concentrators for building-integrated photovoltaics*, Solar Energy Materials & Solar Cells (submitted for publication).
- J62 L.A. Richards, A.I. Schäfer, **B.S. Richards**, B. Corry (2011) *The importance of dehydration in determining ion transport in narrow pores*, Small (submitted for publication).
- J63 N. Sarmah, **B.S. Richards**, T.K. Mallick (2011) *Design, development and indoor performance analysis of a low concentrating dielectric photovoltaic module*, Progress in Photovoltaics (submitted for publication).
- J64 E.K. Klampaftis, D. Ross, S. Seyrling, A.N. Tiwari, **B.S. Richards** (2011) *Increase in short-wavelength response of encapsulated CIGS devices by doping the encapsulation layer with luminescent material*, Solar Energy Materials & Solar Cells (submitted for publication).

Publications

Conference Papers - list not up to date after 2009

- C1 B. Koopmans, **B.S. Richards**, P.V. Santos, M. Cardona (1996) *Optical anisotropy of GaAs/AlAs multiple quantum wells probed by rotational difference spectroscopy*, Spring Conf. of the German Physical Society, Regensburg, Germany.
- C2 B. Koopmans, **B.S. Richards**, P.V. Santos, M. Cardona (1996) *Microscopic and phase resolved study of the in-plane birefringence of GaAs/AlAs multiple quantum wells*, Proc. of European Physical Society, Italy.
- C3 B. Koopmans, **B.S. Richards**, P.V. Santos, M. Cardona (1996) *Anisotropic dielectric response of GaAs/AlAs multiple quantum wells studied by microscopic reflectance difference spectroscopy*, 23rd Intl. Conf. on Physics of Semiconductors, Berlin.
- C4 **B.S. Richards**, A. Lambertz, A.B. Sproul (1997) *Optical characterisation of sputtered silicon thin-films on glass for solar cell applications*, ANZSES 1997, paper no. 113.
- C5 A. Lambertz, **B.S. Richards**, A.B. Sproul, T. Puzzer, M. Gross (1998) *Sputter deposited and solid phase crystallised silicon films for solar cells*, 2nd WCPEC, Vienna, Austria, pp.1507–1510.
- C6 **B.S. Richards**, A. Lambertz and A.B. Sproul (1998) *Optical characterisation of sputtered silicon thin films on glass*, 2nd WCPEC, Vienna, Austria, pp.1294–1297.
- C7 J.E. Cotter, **B.S. Richards**, F. Ferrazza, C.B. Honsberg, T.W. Leong, H.R. Mehrvarz, G.A. Naik, S.R. Wenham (1998) *Design of a simplified emitter structure for buried contact solar cells*, 2nd WCPEC, Vienna, Austria, pp.1511–1514.
- C8 **B.S. Richards**, J.E. Cotter, F. Ferrazza, C.B. Honsberg, S.R. Wenham (1998) *Lowering the cost of commercial silicon solar cells*, Proc. of EERE 1998, pp.303–308.
- C9 **B.S. Richards**, J.E. Cotter, C.B. Honsberg, S.R. Wenham (2000) *Novel Uses of TiO₂ Films in Crystalline Silicon Solar Cells*, 28th IEEE Photovoltaic Specialists Conference (PVSC), pp.375–378.
- C10 **B.S. Richards**, A.I. Schäfer (2001) *Implications of membrane choice on the design of solar-powered water purification systems for remote communities*, Community Technology 2001, 5–7 Jul, Perth, Western Australia.
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