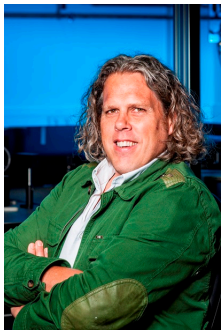

Prof. Dr. Bryce S. Richards

Citizen: New Zealand, Australian and U.K.

Email: bryce.richards@kit.edu

Academic Positions

Karlsruhe Institute of Technology (KIT), Germany
Institute for Microstructure Technology (IMT) and
Light Technology Institute (LTI)
Faculty of Electrical Engineering and Information Technology
Co-Director of IMT and LTI (Apr 2014 –)
W3 Professor of Nanophotonics for Energy (Apr 2014 –)

Nelson Mandela African Inst. Sci. & Tech. (NM-AIST), Tanzania
Department of Materials Science & Engineering
Visiting Professor (Apr 2013 – Mar 2014)

University of Dar es Salaam (UDSM), Tanzania
Department of Physics & College of Engineering and Technology
Visiting Professor (Oct 2012 – Apr 2013)

Heriot-Watt University (HWU), Edinburgh, Scotland
School of Engineering and Physical Sciences
Full Professor - Inst. Photonics & Quantum Science (Sep 2008 – Mar 2014)
Reader - Department of Mechanical Engineering (Aug 2006 –)
Lecturer - Department of Mechanical Engineering (Jul 2006)

Swiss Federal Institute of Technology (ETH), Zürich, Switzerland
Thin Film Physics Group of Prof. Ayodhya Tiwari
Visiting Fellow (Mar 2006 – Jul 2006)

Australian National University (ANU), Canberra, Australia
Centre for Sustainable Energy Systems
Australian Research Council (ARC) Research Fellow (Mar 2005 – Jul 2006)

University of New South Wales (UNSW), Sydney, Australia
ARC Photovoltaics Centre of Excellence
Lecturer (25%) / Postdoctoral Fellow (75%) (Apr 2002 – Mar 2005)

Research Interests

– Spectral conversion for solar energy harvesting: luminescent down-shifting (LDS), luminescent solar concentrators (LSC), up-conversion (UC), down-conversion (DC);
– Luminescent materials for novel applications (temperature sensing, plastics recycling, security & anti-counterfeiting)
– UC quantum yields and PL lifetimes – correlation to materials properties
– Photovoltaics: perovskite solar cells, third generation PV concepts;
– Nanophotonic structures for enhanced light in-coupling and anti-soiling;
– Solar-driven water treatment processes: i) batteryless PV-powered membrane filtration systems; ii) photocatalytic membrane systems.

Teaching

KIT: Solar Energy (lecture, tutorial & laboratory; Fabrication & Characterisation of Optoelectronic Devices; Novel Concepts for Solar Energy Harvesting (seminar)
HWU: Renewable Energy Technologies; Demand Management & Energy Storage; Advanced Renewable Energy Engineering;
UNSW: Renewable Energy Policy, Life Cycle Assessment, Wind Energy Converters;

Education

University of New South Wales, Sydney, Australia
PhD (Electrical Engineering) (Mar 1998 – Apr 2002)
- Novel uses of TiO_2 films in silicon photovoltaics, including single-material double-layer antireflection coatings, and surface passivation techniques.

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
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

Leadership Experience
- Co-director of both IMT and LTI (2014 –)
- Strategic advisory member Joint UK-India Clean Energy Centre (2017 – 2021)
- Founding Director: Scottish Institute for Solar Energy Research (SISER) (2009 – 2012) – A virtual institute of 25 academics from 11 Scottish institutions.
- Deputy-Director of Joint Research Institute in Energy (2007 – 2012).
- Programme Director for MSc in Renewable Energy Engineering (2006–2013).

Conference Organising
- Committee member for: i) OSA Advanced Photonics Congress – PVLED (2019 –); ii) Photoluminescence of Rare-Earths Conference (2024 –); iii) SPIE Europe - Photonics for Solar Energy Systems (2012 – 2013); iv) IEEE PV Specialists Conf. (2011,2014); iii) IET Renewable Power Generation Conf. (2013); v) EU PV Solar Energy Conf. (2009 – 2012); vi) PVSAT - the UK PV conference (2007 – 2012); vii) Conference on Water and Sanitation in International Development and Disaster Relief (2008).
- Local organiser for UK PV conference (PVSAT7) held in Edinburgh (2011).

Board Membership
- Specialty Chief Editor of Light Sources and Luminescent Materials section of *Frontiers in Photonics* (2021 –).
- Editor-in-chief of Advanced Energy Materials section of *Energies* journal (2019 – 2021).
- International Commission on Glass - Technical committee optoelectronics (TC20) (2016 – 2019).
- EU Photovoltaic Technology Platform steering committee member (2014 – 2016).
- Member of EPSRC Peer Review College (2013 –).
- Associate editor for *IET Renewable Power Generation* journal (2012 –).
- Managing Editor of *Progress in Photovoltaics* (PIP) journal (2006 – 2009).
- Technical Advisory Board member, Translucent Inc, USA (2008 – 2010).

Reviewing
- Departmental performance reviewer for: TU Eindhoven, Netherlands (2010).
- External examiner for PhD candidates at: Freiburg, Imperial College, NUS, ANU, NTNU, Aarhus, Surrey, IIT Roorkee.
- Grant reviewer for: ERC (EU); DFG (Germany); ANR (France); AKA (Finland); ARC (Australia); NSF (Switzerland); DoE (USA); NRF (Singapore); NSERC (Canada); HKIEd (Hong Kong); KAUST (Saudi Arabia); TNO (Netherlands); FONDECYT (Chile); EPSRC, Royal Society, Leverhulme Trust, British Council (all UK).

Research Funding

Third Party Funding Summary

Research funding has been awarded from a wide range of sources, including both Australian Research Council (ARC) and the Engineering & Physical Sciences Research Council (UK), European Union (EU), German Research Foundation (DFG), Federal Ministry for Education and Research (BMBF), fully- and partly-funded projects from industry, as well as other trusts and professional bodies. Overall, as of Mar 2023, **current funding amounts awarded total €20.1 million**, with €15.5 million coming from national and EU funding, €2.2 million of industry funding, and €2.4 million from other sources. Note that the amounts mentioned are not for the total project budget, but instead for the third party fraction awarded to my part of the project only (PI = principal investigator, CI = co-investigator).

Technology Transfer Projects

- Technology transfer project to develop up-conversion photonic markers for plastics recycling and anti-counterfeiting applications (PI, KIT budget €527,000 over 3 years, with matching industry contribution) (Sep 2015).

Industrial R&D Projects

- Feasibility study for a solar powered laser (PI, KIT budget €447,000 over 38 months - 100% industry contribution) (Feb 2018).
- Feasibility study for thermally-excited up-conversion luminescence (PI, KIT budget €49,500 over 6 months - 100% industry contribution) (May 2016).
- Industrial research grant from ITW (USA) to develop spectral conversion coatings for CdTe PV modules (PI, HWU budget £150,000 over 1 year - 100% industry contribution) (Jan 2012).
- 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 (PI, HWU budget £80,000 over 3.5 years - 40% industry contribution) (Oct 2011).
- ETP studentship to forward the luminescent solar concentrator technology with Teknova (Norway) and Univ. Edinburgh (PI, HWU budget £75,000 over 3.5 years - 33% industry contribution) (Sep 2011).
- TSB SPARK award and MoD sub-contract together with Trackdale (UK) to investigate a infrared harvesting PV device (PI, HWU budget £5,000 over 1 month and £10,000 over 2 months, respectively - 50% industry contribution) (Apr 2009).
- TSB Technology Programme grant together with NaREC (UK) to develop a 20% efficient Si solar cell (PI, HWU budget £365,000 over 3 years - 50% industry contribution) (Oct 2007).
- Industrial research grant from BASF (Germany) to develop NIR-harvesting LSCs (PI, ANU budget €350,000 over 3 years - 100% industry contribution) (Jun 2005).

Research Funding

National Research Councils and European Union

Germany

- EU PhotonHub project with Ampode (UK), KIT (PI, IMT budget €30,000 over 12 months) (Mar 2023).
- EU ACTPHAST4R project to develop high quantum yield metal halide perovskite core-shell nanocrystals for luminescent photovoltaics (LudoCrys) with Univ. Twente, KIT (PI, IMT budget €60,000 over 6 months) (Apr 2023).
- EU PhotonHub project to develop hybrid organic-inorganic luminophores for agritech spectral conversion with Lambda Energy (UK), KIT (CI, IMT budget €95,500 over 12 months) (Mar 2023).
- Helmholtz Imaging project to develop biocompatible and efficient Nanocrystals for SWIR imaging (BENIGN), KIT (CI, IMT budget €100,000 over 24 months) (May 2023).
- Helmholtz solar technology acceleration Platform (Solar-TAP), KIT (CI, IMT budget €300,000 over 36 months) (Jan 2023).
- Helmholtz future technology: perovskite-silicon tandem solar cells (Energiewende), KIT (CI, IMT budget €300,000 over 36 months) (Nov 2022).
- DFG project SOLEMBA on solar-driven degradation of water-borne micropollutants via novel photocatalytic polymer membranes with active porphyrin surface layer with Institute for Advanced Membrane Technology (IAMT), KIT (PI, IMT budget €318,700 over 36 months) (Mar 2022).
- EU ACTPHAST 4.0 project SCoPA on spectral conversion for photovoltaics and agritech (CI, KIT budget €94,500 over 6 months) (Feb 2022).
- DFG project ClaraLux on single crystals and nanocrystalline materials for efficient upconversion together with Humboldt Univ. and Prokhorov General Physics Institute (RAS) (CI, KIT budget €331,550 over 36 months) (Jan 2021).
- DFG international collaboration project SolPhoWat on solar-driven photocatalytic materials for water treatment together with UDSM (Tanzania) and UP (South Africa) (PI, KIT budget €30,380 over 12 months) (Feb 2021).
- BMWi grant LiKE - together with Siemens, ifu Hamburg, Polysecure, MetisMotion, THM recycling solutions, TU Dresden, TU Freiberg - to develop optical markers for lightweight construction technologies in life-cycle products for energy applications (CI, KIT budget €201,000 over 3 years) (Nov 2020).
- BMBF grant Tasteful - together with Polysecure, HD Vision Systems, Fraunhofer IGCV, HS Pforzheim - to develop tracer-based sorting markers for efficient and flexible sorting (CI, KIT budget €158,000 over 3 years) (Sep 2020).
- DFG international collaboration project on photovoltaic-powered ultrafiltration system for provision of clean drinking water together with KNUST (Ghana) (CI, KIT budget €1,880 over 12 months) (Nov 2020).
- DFG international collaboration project SolNF on solar energy powered nanofiltration system for drinking water: water-energy nexus in Burkina Faso (CI, KIT budget €4,920 over 12 months) (Nov 2020).
- BMBF grant MaReK (extension project) together with HS Pforzheim, Polysecure, Grüne Punkt, and Werner & Mertz to develop tracer-based sorting for plastics recycling (CI, KIT budget €141,000 over 9 months) (Mar 2020).
- EU Horizon2020 grant PERICSTAND together with IMEC, ZSW, EMPA, and others to develop all-thin-film perovskite-CIS tandem PV devices (CI, KIT budget €600,000 over 3 years) (Oct 2019).
- BMWi grant 27%+6% together with ISFH to evaluate high-efficiency three-terminal perovskite-silicon tandem solar cells (CI, KIT budget €785,000 over 3 years) (Oct 2019).
- BMWi grant Capitano together with ZSW to develop high-efficiency perovskite-CIGS PV modules (CI, KIT budget €2,104,000 over 3 years) (Jul 2019).

Research Funding

National Research Councils and European Union cont.

Germany cont.

- BMBF grant CEWAG together IFG-MT and Univ. of Gambia to develop clean water & energy solutions for Gambia (CI, KIT budget €200,000 over 2.5 years) (Jun 2019).
- Helmholtz Innovationspool Zukunftsthema Energiesystemintegration. (CI, KIT budget €675,000 over 2 years) (Mar 2019).
- Sino-German DFG grant to develop high-performance all-inorganic perovskite/crystalline silicon tandem solar cells together with Nanjing Univ. (CI, KIT budget €296,500 over 3 years) (Apr 2018).
- BMBF grant PrintPero together with Technological-Educational Institute of Western Greece, Brite Hellas, and Sunovation to develop printed perovskite modules for building integrated photovoltaics (PI, KIT budget €219,000 over 3 years) (Mar 2018).
- Helmholtz Initiative and Networking Fund grant PEROSEED together with HZB, FZJ, HZDR and DLR to develop high efficiency, lead-free, stable perovskite solar cells (CI, KIT budget €850,000 over 3 years) (Feb 2018).
- BMBF grant MaReK together with HS Pforzheim, Polysecure, Grüne Punkt, and Werner & Mertz to develop tracer-based sorting for plastics recycling (CI, KIT budget €480,000 over 2.5 years) (Jul 2017).
- Helmholtz Energy Materials Foundry (HEMF) large investment (CI, KIT budget €3,500,000 over 5 years) (Apr 2016).

United Kingdom

- EPSRC grant SUNTRAP together with Univ. Glasgow and others on integrated photo-solar-thermoelectric energy conversion and storage (CI, HWU budget £515,000 over 4 years) (Feb 2013).
- EU TEMPUS grant SOLEDA to use advanced learning aids to teach solar energy system design - and EU-Egyptian collaboration (CI, HWU budget €86,000 over 3 years) (Oct 2012).
- EPSRC grant together with Chinese Academy of Sciences (Fujian Institute of Research on the Structure of Matter) to investigate Luminescent Lanthanide Layers for Enhanced Photovoltaic Performance (L^3EAP^2) (PI, HWU budget £631,000 over 3 years) (Feb 2011).
- EU FP7 grant NanoSpec to investigate up-conversion for concentrating silicon solar cells (PI, HWU budget €576,000 over 3 years) (Apr 2010).
- TSB Technology Programme grant together with NaREC (UK) to develop a 20% efficient Si solar cell (PI, HWU budget £365,000 over 3 years) (Oct 2007).
- EPSRC Feasibility Study grant together with Profs. Robertson and Jones (Univ. Edinburgh), Lucite and NaREC to investigate novel organic dyes for luminescent solar concentrators (LSC) (PI, HWU budget £161,000 over 1.5 years) (Jun 2007).

Australia

- ARC Linkage International together with Prof. Tiwari at ETH Zürich, Switzerland investigating potential of luminescent down-shifting for CdTe and CIGS solar cells (PI, ANU budget A$10,000 over two years) (May 2006).
- ARC Linkage together with SierraTherm Production Furnaces (USA) and SunPower Corp. (USA) (PI, ANU budget A$516,000 over 3 years) (Mar 2005).
- ARC Linkage together with Dr. Schäfer (Univ. Wollongong) and Mono-Pumps (Australia) to develop the PV-powered desalination system (CI, A$330,000 over 3 years) (May 2003).

Research Funding

Other

- KIT investment in two X-ray diffractometers for perovskite thin films and spectral conversion nanocrystals (PI, €535,000) (Mar 2021).
- Baden-Württemberg Ministry of Science, Research and the Arts project together with Prof. A.I. Schäfer (IAMT, KIT) and Univ. of Namibia to work on solar-driven photocatalytic membrane reactors (SPheRe) for provision of clean drinking water (PI, KIT budget €50,000 over 2 years) (Mar 2021).
- Baden-Württemberg Stiftung "Internationale Spitzenforschung" for Paetzold and Richards together with Australian National University to work on advanced multi-junction perovskite/silicon photovoltaics (CI, KIT budget €439,450 over 3 years) (Sep 2018).
- Heriot-Watt EPSRC Impact Acceleration Award for Klampaftis and Richards to prototype full-size multi-coloured, high-efficiency, photovoltaic panels (CI, HWU budget £11,500 over 3 months) (Feb 2013).
- Royal Society Leverhulme Africa Award for a collaborative project in the area of thin film solar cells and photovoltaics systems between UDSM (Tanzania) and HWU (PI, HWU budget £180,000 over 3 years) (Jun 2012).
- Royal Society Leverhulme Trust Senior Research Fellowship to enable me to undertake a sabbatical year collaborating with Tanzanian PV researchers to develop earth-abundant inorganic thin-film solar cells (PI, HWU budget £51,854 over 1 year) (Jun 2012).
- Carnegie Trust Larger Grant to employ a solar energy technologist to facilitate research collaboration across the nine Scottish universities involved in SISER (PI, HWU budget £40,000 over 1.5 years with additional support from SISER £5,000 and ETP £10,000) (May 2012).
- European Regional Development Fund to support the employment of a business development manager for the solar energy theme of the Energy Technology Partnership (CI, HWU budget £150,000 over 3 years) (Oct 2011).
- Leverhulme Trust Research Grant to investigate the aesthetic integration of PV into buildings (PI, HWU budget £239,000 over 3 years) (Oct 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 (CI, HWU budget €40,000 over 1 year) (Jan 2010).
- 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 (PI, £56,000 + HWU matching funding) (May 2007).
- 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, HWU budget £30,000 over 1 year) to develop coloured BIPV windows (Feb 2007)
- Solar-powered desalination system field trials in the Australian outback - sponsorship from ANU, local industry, state and federal government (CI, ANU budget A$21,800) (Sep 2005).
- UNSW grant for a low-escape-cone loss LSC (PI, A$15,000 over 1 year) (Dec 2003).
- UNSW grant to design and fabricate a PV-powered water treatment system for remote areas (CI, A$40,000 over 1 year) (Jun 2001).

Professional Experience

Consultant: Photovoltaics & Luminescence Concepts (2002 –)

- Consulting projects via KIT - Campus Transfer with CTF Solar (Germany), Lambda Energy (UK), Toyota (Europe and Japan), and E.G.O. (Germany)
- Performed consulting for Photon Solutions (UK), AdvanceSis (UK), Bookham Technology (UK), SunPower Corporation (USA), Amonix (USA), Translucent (USA), Dow Corning (USA), Varian Seminconductor (USA), Nissan Chemical (Japan).

Eurosolare S.p.A., Nettuno, Italy
Research Engineer (Jul 1998, Jun 2000)

- Team member responsible for technology transfer for an ARC grant between UNSW and Italian PV manufacturer Eurosolare S.p.A., advising on implementation of buried-contact solar cell technology at a pilot production line level.

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
Research assistant, Dept. of Prof. Manuel Cardona (Jan 1995 – Dec 1995)

- Design and construction of PC-controlled Raman microscope; measuring optical properties of laser crystallised a-Si films and GaAs/AlGaAs quantum wells.

Prizes and Awards

- Joint winner of the Undine Award 2022 (category Şsource of lifeŤ, €20,000 prize money) for solar-powered water treatment R&D Ű see: (`https://www.jw-stiftung.de/aktuelles/11-aktuelles/57-undine-award-2022-gewinner-2.html`)
- Best paper prize at PVSAT4 Conference, Bath, U.K. 2008.
- Mondialogo Engineering Award - a partnership between DaimlerChrysler and UNESCO - including US$18000 prize money, May 2005, Berlin, Germany (`www.unesco.org/new/en/natural-sciences/priority-areas/sids/science-technology/mondialogo-engineering-awards/`).
- Energy Globe Awards - received 2^{nd} prize in the Water category at the in Linz, Austria (`www.energyglobe.at/awards/details/awdid/9748/`).
- CSIRO/ATSE prize to attend World Renewable Energy Congress VII (Cologne, Germany) and represent Australia at the Australia-European workshop (2002).

Membership IEEE (senior member), Optica/OSA (senior life member), SPIE (life member), ACS (member) ACS (member).

Languages English (native), German (level C2).

Identifiers Web of Science ResearcherID: L-5512-2014
ORCID: 0000-0001-5469-048X

Publication List: Prof. Dr. Bryce S. Richards

Ranking Ranked in top 2% of scientists world-wide ($\tilde{\#}$12000) by Stanford University in 2020 -2022 based on composite score: `https://dx.doi.org/10.17632/btchxktzyw`

Citations Multidisciplinary research interests and numerous collaborations mean that I publish in a range of journals in the fields of electrical engineering, applied physics, optics, materials science, chemistry and broader engineering journals. A complete list of publications follows on the next pages. My current **h-index** is:

- **h = 68 according to Google Scholar** `https://scholar.google.co.uk/citations?user=u9SQnOcAAAAJ&hl`
- **h = 56 according to Web of Science** `https://www.webofscience.com/wos/author/record/L-5512-2014`

Due to the very large number of conference publications I no longer include these in my publication list, unless they are **invited talks**, which are listed at the end.

Publications

Patents

*P*1 **B.S. Richards**, A. Boehm, A. Grimm "Photovoltaic modules with improved quantum efficiency" (WO/2008/110567) (RG).

*P*2 A. Turshatov, **B.S. Richards**, I. Howard "New medium for TTA-photon upconversion in polymer host matrix" (EP3156472B1 - A15017).

*P*3 G. Gao D. Busko, I.A. Howard, A. Turshatov, **B.S. Richards** "New composition of photonic markers with enhanced upconversion luminescence" (patent pending).

*P*4 A. Turshatov, D. Busko, T. Samanta **B.S. Richards**, I.A. Howard "Composition of submicron crystals with enhanced upconversion" EP3842506.

*P*5 N. Katumo, D. Busko, I.A. Howard, A. Turshatov, **B.S. Richards** "Photonic markers enabling temperature sensing and/or security marking using low frame rate cameras" (2021/6/30) EP 3842505A1, US 20230022560 (Jan 2023).

*P*6 K. Li, N. Katumo, D. Busko, I.A. Howard, A. Turshatov, **B.S. Richards** "Photonic markers enabling temperature sensing and security marking using low frame rate cameras" (102021003206.3) (Patent pending).

Publications ***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 (RG).

B2 **B.S. Richards** (2002) "Novel Uses of titanium dioxide for silicon solar cells", PhD thesis, Centre for Photovoltaic Engineering (UNSW), ISBN 0733419712 (RG).

B3 **B.S. Richards**, M.A. Green (2005) "Photovoltaic cells" entry for Encyclopaedia of Biomedical Engineering, Wiley, 12pp (RG).

B4 **B.S. Richards**, A. Shalav (2007) "Photovoltaic devices" chapter 8 of The Handbook of Photonics (2^{nd} Ed.), eds. M.C. Gupta and J. Ballato, CRC Press, Boca Raton, FL, USA, pp. 8:1–27 (invited) (RG).

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 (RG - front matter).

B6 **B.S. Richards**, A.I. Schäfer (2009) "Renewable energy powered water treatment systems" chapter 12 of Sustainable Water for the Future - Water Recycling versus Desalination, Elsevier Science, (invited), pp. 353–374 (RG).

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 (RG).

B8 J.A.K̇harraz, **B.S. Richards**, A.I. Schäfer (2017) "Autonomous solar-powered desalination systems for remote communities" chapter 3 of Desalination Sustainability: A Technical, Socioeconomical and Environmental Approach, Elsevier Science (invited).

B9 J. Woidasky, J. Schmidt, M. Auer, I. Sander, A. Schau, J. Moesslein, P. Wendler, D. Kirchenbauer, D. Wacker, G. Gao, A. Turshatov, **B.S. Richards**, S. Wiethoff, C. Lang-Koetz (2020) "Photoluminescent Tracer Effects on Thermoplastic Polymer Recycling" chapter of Advances in Polymer Processing 2020, eds: C. Hopmann, R. Dahlmann, Springer, pp. 1–13.

B10 **B.S. Richards**, A.I. Schäfer (2021) "Renewable Energy Powered Nanofiltration" chapter 22 of Nanofiltration - Principles, Applications and Novel Materials, eds: A.I. Schäfer, A.G.Ḟane, Wiley VCH (invited).

Publications ***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 (RG).

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 optical anisotropy of GaAs/AlAs multiple quantum wells probed by microscopic reflectance difference spectroscopy,* Applied Physics Letters, 69(6), 782–784 (RG).

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 (RG).

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 TiO_2 coated silicon wafers,* Applied Physics Letters, 80(7): 1123–1125 (RG).

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 (RG).

J8 **B.S. Richards**, S.F. Rowlands, C.B. Honsberg, J.E. Cotter (2003) *TiO_2 DLAR coatings for planar silicon solar cells,* Progress in Photovoltaics, 11(1), 27–32 (RG).

J9 **B.S. Richards** (2003) *Single-material TiO_2 double-layer antireflection coatings,* Solar Energy Materials & Solar Cells, 79(3), 369–390 (RG).

J10 **B.S. Richards**, A.I. Schäfer (2003) *Photovoltaic-powered desalination system for remote Australian communities,* Renewable Energy, 28, 2013–2022 (RG).

J11 **B.S. Richards**, S.F. Rowlands, A. Ueranatasun, J.E. Cotter, C.B. Honsberg (2004) *Potential cost reduction of buried-contact solar cells through the use of titanium dioxide thin films,* Solar Energy, 76(1-3), 269–276 (RG).

J12 **B.S. Richards**, A. Lambertz, A.B. Sproul (2004) *Determination of the optical properties of non-uniformly thick non-hydrogenated sputtered silicon thin films on glass,* Thin Solid Films, 460, 247–255 (RG).

J13 **B.S. Richards**, S.R. Richards, M.B. Boreland, D.N. Jamieson (2004) *High temperature processing of TiO_2 thin films for application in silicon solar cells,* Journal of Vacuum Science & Technology A, 22(2), 339–348 (RG).

J14 **B.S. Richards** (2004) *Comparison of TiO_2 and other dielectric coatings for buried-contact solar cells: A review,* Progress in Photovoltaics, 12, 253–281 (RG).

Publications ***Journal Articles cont.***

J15 A.I. Schäfer, C. Remy, **B.S. Richards** (2004) *Performance of a small solar-powered hybrid membrane system for remote communities under varying feedwater salinities*, Water Science and Technology: Water Supply, 4(5Ű6), 233Ű-243 (RG).

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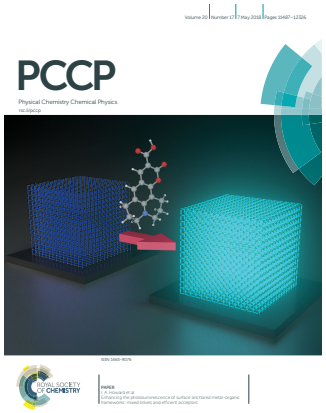
J279 E. Madirov, S.V. Kuznetsov, V.A. Konyushkin, D. Busko, **B.S. Richards**, A. Turshatov (2023) *Pushing the limits: Down-converting Er^{3+}-doped BaF_2 single crystals with photoluminescence quantum yield surpassing 100%*, ACS Materials Letters (submitted).

J280 J.C. Fischer, R. Steentjes, D.-H. Chen, **B.S. Richards**, E. Zojer, C. Wöll, I.A. Howard (2023) *Controlling structural growth of layer-by-layer spin-coated zinc dicarboxylate-based metal-organic thin films*, (submitted).

J281 M. Van de Voorde, D. Hudry, D. Busko, **B.S. Richards**, R. Saive (2023) *Investigating the impact of ytterbium-rich impurities on the luminescent down-shifting performance of $CsPbCl_3$:Yb^{3+} nanocrystals*, Journal of Physical Chemistry Letters (submitted).

J282 I.A. Howard, D. Busko, P. Wendler, E. Madirov, A. Turshatov, J. Moesslein, **B.S. Richards** (2023) *Sorting plastics waste for a circular economy: Perspectives for lanthanide luminescent markers* , Resources, Conservation and Recycling (submitted).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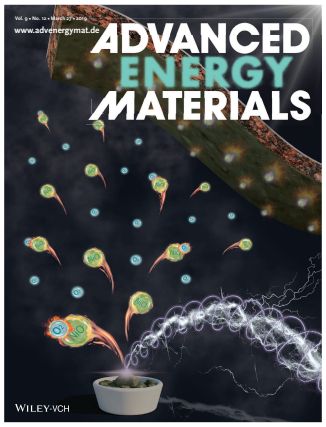
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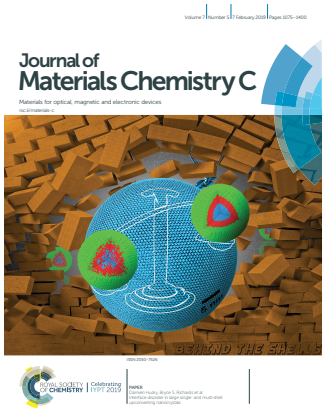
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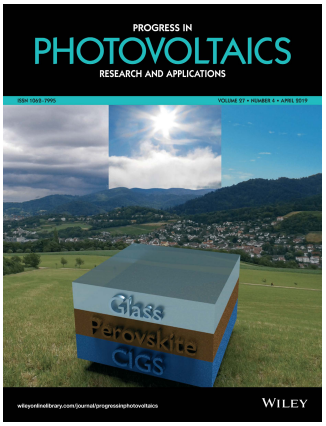
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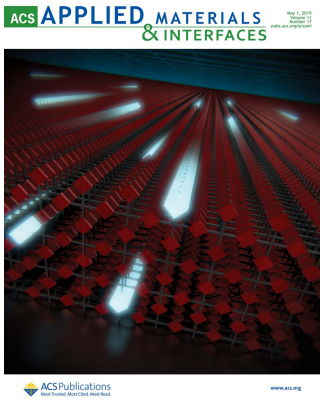
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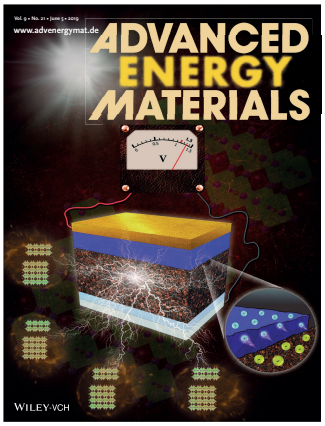
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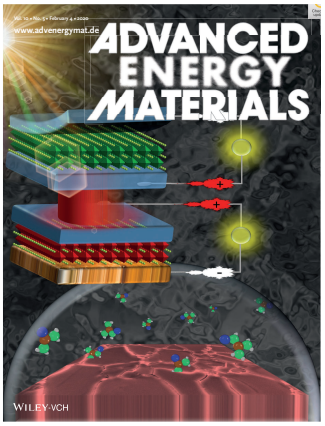
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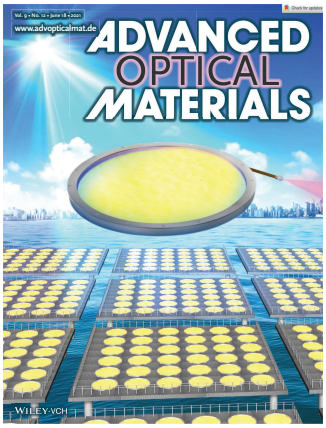
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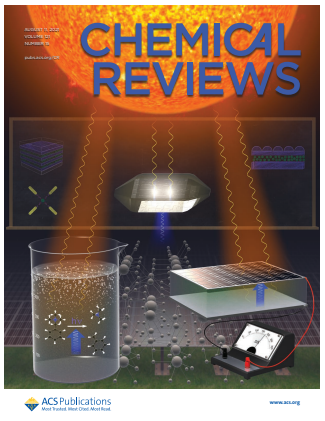
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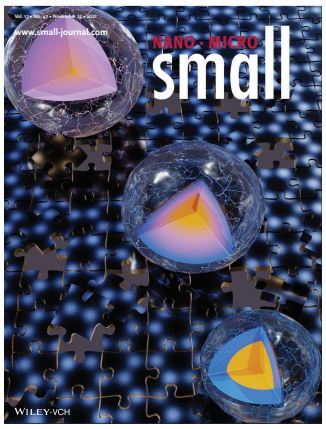

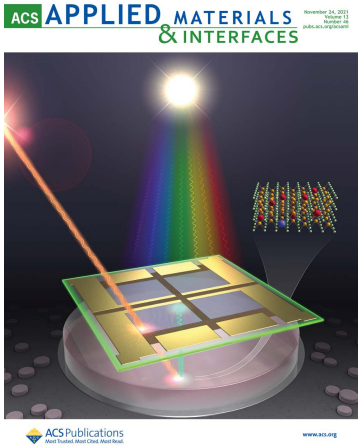

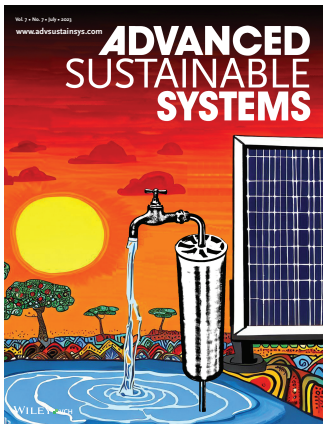

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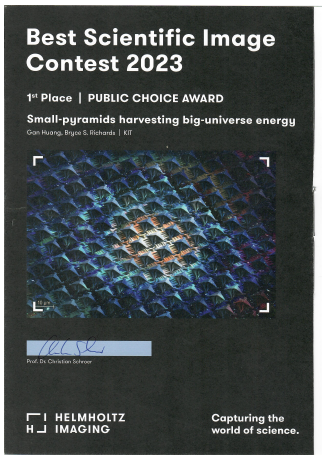

Dr. Gan Huang and Prof. Bryce Richards, 1st place in the Public Choice Award category, Helmholtz Imaging Best Scientific Image Contest 2023

Publications

Invited Talks

*T*1 **B.S. Richards** (2002) *Novel applications of TiO_2 thin films in silicon solar cells,* Australian-European Workshop at World Renewable Energy Congress VII, 30 June, Köln, Germany.

*T*2 **B.S. Richards** (2002) *Multilevel solar cells,* Conference on Optoelectronic and Microelectronic Materials and Devices (COMMAD), 11–13 Dec, Sydney, Australia.

*T*3 A.I. Schäfer, C. Remy, **B.S. Richards** (2003) *Solar energy and membrane hybrid processes for remote community water supplies: reverse osmosis solar installation (ROSI),* Desalination and the Environment -Fresh Water for All, 4–8 May, Malta.

*T*4 **B.S. Richards** (2005) *Bridging the gap between first and third generation photovoltaics via the application of passive luminescence converters*, Book of Abstracts for the XIV International Materials Research Conference (IMRC) - Symposium 4: Solar Cells & Solar Energy Materials Symposium, Cancun, Mexico, 21–26 Aug 2005, p. 83.

*T*5 **B.S. Richards**, A.I. Schäfer (2005) *Remote community water supply using membrane technology and renewable energy -a summary of project development and field trials in Australia,* Environmental Engineering Event, Hobart, Australia.

*T*6 **B.S. Richards**, B.C. Rowan, D. Ross, E. Klampaftis, L.R. Wilson, S. Ciorba, N. Robertson, A.C. Jones (2010) *Enhancing the performance of photovoltaic devices via the application of luminescent materials,* Renewable Energy Research Conference, 7Ũ-8 Jun 2010, Trondheim, Norway.

*T*7 J. Marques-Hueso, D. Chen, S.K.W. MacDougall, Y.S. Wang, **B.S. Richards**, (2010) *Advances in spectral conversion for photovoltaics: up-converting Er^{3+} doped YF^3 nano-crystals in transparent glass ceramic,*, SPIE Next Generation (Nano) Photonic and Cell Technologies for Solar Energy Conversion II, 21 Aug 2011, San Diego, USA, Proc. SPIE 8111, 811102.

*T*8 **B.S. Richards**, S.K.W. MacDougall, J. Marques-Hueso, S. Ciorba, A. Ivaturi (2011) *Challenges in the realisation of up- and down-conversion photovoltaic devices,* 7^{th} Photovoltaic Science Application and Technology (PVSAT-8) Conference, Edinburgh, Scotland, 6–8 Apr 2011.

*T*9 **B.S. Richards**, A. Ivaturi S.K.W. MacDougall, J. Marques-Hueso (2012) *Up- and down-conversion materials for photovoltaic devices,* SPIE Photonics for Solar Energy Systems, 16–18 Apr 2012, Brussels, Belgium, Proc. SPIE Volume 8438.

*T*10 A.-M. Fuller, E. Klampaftis, D. Ross, D. Alonso-Alvarez, M. Zettl, **B.S. Richards** (2012) *Polymer layers doped with luminescent materials for enhancement of solar cell performance,* Polymers in Photovoltaics Conference, 24–26 Apr 2012, Cologne, Germany.

*T*11 S.K.W. MacDougall, A. Ivaturi, J. Marques-Hueso, **B.S. Richards** (2012) *Spectral leverage: enhancing the photoluminescent quantum yield of upconversion via broadband excitation,*, Optics for Solar Energy Meeting (Optical Society of America), 11–14 Nov 2012, Eindhoven, Netherlands.

Invited Talks cont.

*T*12 **B.S. Richards**, J. Marques-Hueso, S.K.W. MacDougall, A. Boccolini, J.A.S. Morton, E.D. Mammo, G.E. Arnaoutakis, A. Ivaturi (2013) *Progress towards enhancing the performance of c-Si photovoltaic devices via up- and down-conversion*, Optical Society of America - Optical Nanostructures and Advanced Materials for Photovoltaics, 4–7 Nov 2013, Tucson, Arizona, USA.

*T*13 M. Oldenburg, I.A. Howard, A. Turshatov, D. Busko, S. Wollgarten, N. Baroni, E. Redel, C. Wöll, **B.S. Richards** (2016) *Exciton dynamics in crystalline thin-film surface anchored metal-organic frameworks*, SPIE Photonics for Solar Energy Systems, 5–8 Apr 2016, Brussels, Belgium.

*T*14 **B.S. Richards**, G. Gao, D. Busko, A. Turshatov, I.A. Howard (2016) *Photonic markers for plastics recycling and anti-counterfeiting applications*, Photoluminescence of the Rare Earths Conference (PRE'16), 7–10 Jun 2016, Greenville, SC, USA.

*T*15 S. Dottermusch, A. Quintilla, G. Gomard, D.R. Pernik, V. Reddy, B.A. Korgel, U.W. Paetzold, **B.S. Richards** (2016) *Direct laser written nanophotonics for embedded CIS nanocrystal solar cells*, OSA Optical Nanostructures and Advanced Materials for Photovoltaics, 14–17 Nov 2016, Leipzig, Germany.

*T*16 **B.S. Richards**, D. Busko, G. Gao, D. Hudry, I.A. Howard A. Turshatov (2017) *Application of up-conversion materials for plastic recycling*, Spectral Shaping for Biomedical and Energy Applications (SHIFT2017), 13–17 Nov 2017, Tenerife Spain.

*T*17 A. Turshatov, D. Busko, G. Gao, D. Hudry, I.A. Howard, **B.S. Richards** (2018) *Optimization of up-conversion photonic markers based on a La_2O_3 host for plastics recycling and anti-counterfeiting applications*, 1^{st} International Conference on Dielectric Photonic Devices and Systems Beyond Visible (D-Photon), 1–2 Oct 2018, Bari, Italy.

*T*18 **B.S. Richards** (2020) *Applications of up-conversion: from photovoltaics to plastic recycling and anti-counterfeiting*, Invited seminar at Univ. Aarhus, Denmark, 21 Jan 2020.

*T*19 **B.S. Richards**, S. Dottermusch, I.A. Howard, J.-F. Bisson, M. Endo, T. Masuda (2020) *Luminescent-solar-concentrator-pumped fibre laser*, SPIE Photonics Europe, 29 Mar – 2 Apr 2020, Strasbourg, France (cancelled due to Covid-19).

*T*20 **B.S. Richards**, T.E. Berger, C. Regmi, A.I. Schäfer (2020) *Atomic-layer-deposited ultra-thin TiO_2 films coated into ceramic membranes for photocatalytic water treatment*, 2^{nd} MSSEESA Conference on Materials for Solar Energy Conversion, 4 – 6 Nov 2020, Nairobi, Kenya.

*T*21 **B.S. Richards**, A. Turshatov, D. Busko, D. Hudry, I.A. Howard (2021) *Upconversion: will it ever work for photovoltaics?*, 3^{rd} European Workshop on Optics for Solar Energy, 5–6 Oct 2021, Berlin, Germany.

*T*22 **B.S. Richards**, A.I. Schäfer (2022) *Solar-powered drinking water treatment for Africa*, ANSOLE's 11^{th} Anniversary International Online Conference (A^2IOC 2022), 4 Feb 2022 (online).

*T*23 **B.S. Richards**, A.I. Schäfer (2022) *Renewable Energy for membrane filtration*, Nanofiltration 2022 Conference, 26–30 Jun 2022, Achalm, Germany.

*T*24 **B.S. Richards**, I.A. Howard (2023) *Design rules and performance of luminescent solar concentrators for building integrated photovoltaics*, Invited seminar, 17 April 2023, Univ. of Twente, Netherlands.

Invited Talks cont.

*T*25 **B.S. Richards** (2023) *The potential of luminescent materials to address real-world challenges*, Invited seminar, 24 April 2023, Univ. of Aalborg, Denmark.

*T*26 **B.S. Richards**, D. Busko, D. Hudry, I.A. Howard, A. Turshatov (2023) *A load of rubbish or a big opportunity for luminescent materials?*, 9^{th} South African Conference on Photonic Materials 2023 (SACPM 2023), 8–12 May 2023, Kruger National Park, South Africa (keynote).

*T*27 A. Turshatov, E. Madirov, D. Busko, I.A. Howard, **B.S. Richards** (2023) *Fundamentals and applications of upconversion in lanthanide-doped alkaline-earth fluorides*, 9^{th} South African Conference on Photonic Materials 2023 (SACPM 2023), 8–12 May 2023, Kruger National Park, South Africa.

*T*28 A. Turshatov, E. Madirov, D. Busko, I.A. Howard, **B.S. Richards** (2023) *Tracer-based sorting with lanthanide-activated phosphors for plastics recycling*, International Symposium on Optical Materials (IS-OM'9), 26–30 June 2023, Tarragona, Spain.

*T*29 **B.S. Richards**, D. Busko, F. Arteaga-Cardona, E. Madirov, D. Hudry, I.A. Howard, A. Turshatov (2023) *Up-converting & down-shifting luminescent materials for enhanced plastic sorting*, Gordon Research Conference: Upconverting Nanoparticles, 18–23 June 2023, Waterville Valley, NH, USA.

*T*30 D. Hudry, F. Arteaga Cardona, N. Jain, R. Popescu, D. Busko, E. Madirov, B.A. Arús, D. Gerthsen, A. De Backer, S. Bals, O.T. Bruns, A. Chmyrov, S. Van Aert, **B.S. Richards** (2023) *Atomic scale organisation of rare-earth based core-shell nanocrystals: what if we have all been wrong?*, Gordon Research Conference: Upconverting Nanoparticles, 18–23 June 2023, Waterville Valley, NH, USA.

*T*31 G. Huang, **B.S. Richards** (2023) *Polymer-based multi-function micro-photonic metamaterials for radiative cooling*, SPIE Optics & Photonics conference on New Concepts in Solar and Thermal Radiation Conversion V, 20–24 August 2023, San Diego, USA.