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Kenneth Marshall

Dual UK/ US citizen

Postdoctoral work

2018–2020 Materials Science, Norwegian University of Science and Technology, Trondheim.

Supervisor Professor Mari-Ann Einarsrud

Summary Research on the study of *in situ* hydrothermal synthesis of hexagonal $YMnO_3$, and total X-ray scattering pair distribution function analysis of hexagonal manganite powder samples and *in situ* crystallisation of sol-gel synthesised $YMnO_3$. Synchrotron X-ray diffraction was used to monitor reactions as they progressed under hydrothermal conditions. One publication from this work so far.

– Experience at four beam-times from two synchrotrons; ESRF, France and SPring-8, Japan.

Web Page https://www.ntnu.edu/employees/kenneth.marshall

PhD

2013–2017 Chemistry, University of Warwick, Coventry.
Thesis title: Inorganic Tin Halide Perovskites for Planar Photovoltaic Devices

Supervisors Dr. Ross Hatton, Professor Richard Walton

Summary The study on the use of $CsSnI_3$ in planar architecture photovoltaics. The project involved fabrication and characterisation of polycrystalline $CsSnI_3$ thin films, the study on the use of tin based additives and substitution chemistry on the stability and electronic properties of thin films, and the fabrication and testing of photovoltaic devices made from them. Four papers were published from this work.

Web Page www2.warwick.ac.uk/fac/sci/chemistry/research/hatton/hattongroup/groupmembers/kenneth_marshall

2013–2016 Postgraduate Award in Transferable Skills in Science

Education

2009–2013 MChem, University of Warwick, Coventry, *1st class*, Chemistry,
Master's Project: *Coordination Chemistry of N-Heterocyclic Carbenes*, Supervisor: Adrian Chaplin.

- Synthesis of ligands and palladium carbene pincer complexes for use in catalysis.
- Used glove-box and Schlenk glassware for synthesis under inert atmosphere.
- Ran and analysed NMR and mass spectra for organic molecules and organometallic complexes.

2007–2009 A-levels, Imberhorne School, East Grinstead, Chemistry-A, Maths-A, Physics-A, History AS-B, Further Maths AS-A.
Sixth-from achievement award: Mathematics

Experience

Teaching

2014–2016 **Undergraduate laboratory demonstration**, University of Warwick, Teaching and marking third year undergraduate labs.
This involved helping students for a three day lab experiments; pre-lab interviews, showing equipment and techniques, and marking lab reports.

2014–2016 **Outreach and Open day volunteering**, *Nick Barker*, University of Warwick, Helping out demonstrating experiments to school students in the university's undergraduate labs.
Explaining some of the science behind experiments to the students, showing them how to use the lab equipment, going through the experiment with them, answering their questions.

Research Projects

2013 **Polymers**, *Andrew Dove*, University of Warwick, URSS.
Synthesis of monomers and polycarbonates using ring opening polymerization.

- Use of Schlenk equipment for oxygen- and moisture-free synthesis.
- Multi-stage synthesis of carbonate monomer with different scales. Use of chemicals with different hazard levels requiring careful procedures.
- GPC and NMR analysis for polymers. Extensive NMR for synthesis of organic molecules.

2012 **Inorganic Materials**, *Richard Walton*, University of Warwick.
Hydrothermal synthesis of lanthanum germanates for further synthesis into pyrochlores. Optimisation of synthesis conditions to produce desired product. Analysis of inorganic materials using powder X-ray diffraction.

Conferences

2019 **14th International Conference on Materials Chemistry**, *University of Aston, Birmingham*, 8-10 July, Oral Presentation.

2016 **Organic & Perovskite Solar Cells Conference**, *Crete*, 19-20 Oct., Oral Presentation.

2015 **12th International Conference on Materials Chemistry**, *University of York*, 20-23 July, Poster.

Computer skills

Data analysis, presenting	Python, Excel, OriginPro, LaTeX, Word, Powerpoint
Programming	Python - extensive experience in data processing for *in situ* X-ray scattering; LabVIEW - some experience in instrument communication
Touch typing	Over 60 words per minute

Languages

French	GCSE - A, intermediate level
Norwegian	Level 1 course - A, intermediate level

Interests

Play tennis socially and in local competitions

Play electric guitar

References

Professor Mari-Ann Einarsrud, Norwegian University of Science and Technology, mari-ann.einarsrud@ntnu.no
Dr Ross Hatton, University of Warwick, ross.hatton@warwick.ac.uk
Professor Richard Walton, University of Warwick, r.i.walton@warwick.ac.uk

Papers total citations: > 300 (Google Scholar)

2020 K. P. Marshall, A. B. Blichfeld, S. L. Skjærvø, O. G. Grendal, S. M. Selbach, T. Grande, W. van Beek, M.-A. Einarsrud, A fast, low temperature synthesis method for hexagonal $YMnO_3$: Kinetics, purity, size and shape as studied by *in situ* X-ray diffraction, *Chem. Eur. J.*, in press. Rated in top 20% of papers in journal

2018 K. P. Marshall, S. Tao, M. Walker, D. S. cook, J. L. Hughes, S. Varagnolo, A. Wijesekara, D. Walker, R. I. Walton, R. A. Hatton, $Cs_{1-x}Rb_xSnI_3$ light harvesting semiconductors for perovskite photovoltaics, *Mater. Chem. Front.*, **2**, 1515-1522

2017 K. P. Marshall, M. Walker, R. I. Walton, R. A. Hatton, Elucidating the role of the hole-extracting electrode on the stability and efficiency of inverted $CsSnI_3$/ C_{60} perovskite photovoltaics, *J. Mater. Chem. A*, **5**, 21836-21845.

2017 H. Y. Playford, C. L. Bull, M. G. Tucker, N. Funnell, C. J. Ridley, K. P. Marshall, R. I. Walton, In situ neutron diffraction study of the formation of $Ho_2Ge_2O_7$ pyrochlore at high temperature and pressure, *Dalt. Trans.*, **46**, 15415-15423. Contribution - preliminary experimental work on the synthesis of lanthanum germanates

2016 K. P. Marshall, M. Walker, R. I. Walton, R. A. Hatton, Enhanced stability and efficiency in hole-transport-layer-free $CsSnI_3$ perovskite photovoltaics, *Nat. Energy*, **1**, 16178.

2015 K. P. Marshall, R. I. Walton, R. A. Hatton, Tin perovskite/fullerene planar layer photovoltaics: improving the efficiency and stability of lead-free devices, *J. Mater. Chem. A*, **3**,11631-11640.