University of Birmingham

Dr Allan Walton BSc, PhD

Senior Science City Research Fellow

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About

Dr Allan Walton is a Senior Science City Research Fellow working within the Energy Theme. Allan has expertise in solid state hydrogen storage materials, hydrogen processing of materials, coating technologies, permanent magnetic materials, hydrogen purification membranes and recycling of rare earth materials.

He has published over 20 papers in scientific journals and has contributed to 4 patents held by the University of Birmingham.

Qualifications

- PhD on Corrosion Protection for Rare Earth Permanent Magnets
- BSc in Materials Science

Biography

Allan Walton qualified with a BSc in Materials Science at the University of Birmingham in 1997. He went on to study a PhD on the corrosion protection of Neodymium Iron Boron Magnets (qualified 2002) where he helped develop a zinc alloy coating process called Low Pressure Pack Sublimation which was patented by the University. After a brief spell working as a research associate on corrosion studies for NdFeB permanent magnets he was employed as a research fellow studying solid state hydrogen storage materials at the University of Birmingham.

Dr Walton has worked on five multi disciplinary research projects including; 2001-2003 EU Framework 5 grant (FUCHSIA – Fuel Cells and Hydrogen Stores for Integration into Automobiles). 2003-2005 Carbon Trust R&D project (The Safe Efficient and Economic Large Scale Storage of Hydrogen). 2005-2006 NERC project (A whole System Approach for Analyzing Bio-Energy Demand and Supply). 2006-2009 EU Framework 6 Project (NESSHY – Novel Efficient Solid Storage for Hydrogen).

Dr Walton built and manages the hydrogen laboratories within Metallurgy and Materials installing over 30 pieces of equipment, much of which is bespoke. The hydrogen labs are now one of the leading facilities for the synthesis and characterization of hydrogen storage materials in the UK and is known as a centre of excellence worldwide. Dr Walton has investigated a large range of potential hydrogen storage materials including carbon nanotubes, activated carbons, zeolites, metal organic frameworks, porous polymers, metal hydrides, magnesium-based materials (including melt spun material and high velocity ball milled) and complex hydrides.

In 2009 Dr Walton began working as a Senior Science City Research Fellow (5 year position). His current research is focused in two main areas – solid state hydrogen storage materials and permanent magnetic materials. He is heavily involved in research into recycling of rare earth materials. This research involves the use of hydrogen to extract rare earth magnets from scrap devices and re-processing of that material into new magnets.

Dr Walton works closely with both the Hydrogen Materials Group run by Dr David Book (**www.hydrogen.bham.ac.uk (http://www.hydrogen.bham.ac.uk/)**) and the Magnetic Materials Group run by Dr Andy Williams (**www.magnets.bham.ac.uk (http://www.magnets.bham.ac.uk/)**) at the University of Birmingham

Teaching

Postgraduate:

- MRes course – Materials for Sustainable Energy Technologies; lectures on porous materials for hydrogen storage and purification.
- Materials for Sustainable Environmental Technologies (MSET/MEng); lectures on recycling of NdFeB magnets.

Postgraduate supervision

- Microporous Materials for Hydrogen Storage – Steven Paul Tedds, PhD
- Melt-spun Mg-Ti-Ni alloys for hydrogen storage materials – Xiaodong Yi, PhD
- In-Situ Hydrogen Decrepitation of NdFeB – Jonathan Meakin, MRes

Research

Rare Earth Magnet Research

Present-

- The use of hydrogen decrepitation to extract NdFeB magnets from electronic assemblies

- In-situ removal of magnets from large magnetic assemblies using hydrogen
- Corrosion protection for NdFeB magnets
- Recycling of rare earth magnets
- Strip casting of NdFeB

Hydrogen Storage Research

Present projects –

- Melt spinning of magnesium based alloys
- Assessment of porous polymers for hydrogen storage
- Assessment of metal organic frameworks for hydrogen storage
- The use of 3-D laser confocal microscopy to visualise hydrogen interactions in-situ.

Past research projects –

- Catalysed nanocrystalline MgH_2 for hydrogen storage
- Hydrogen storage properties of zeolitic materials
- Production of multi layered Mg-Pd thin films
- Assessment of "hydrogen spillover" on porous materials
- Assessment of the hydrogen storage properties for carbon nanotubes, activated carbons, carbon soots and templated carbons.
- Development of practical hydrogen storage devices.

Publications

A.Walton, J.D.Speight, A.J.Williams, I.R.Harris (2000) 'A Zinc Coating Method for NdFeB Magnets'. **J. Alloys & Compounds**, 306, p253-261

A.Walton, J.D.Speight, I.R.Harris (2000) 'Low Pressure Pack Sublimation: Newly Developed Zinc Coating Process'. **J. Surface Eng**. Vol.16, No.2, p153, Prize given in the Bodycote paper competition 1999 (invited talk to the Bodycote AGM).

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Budd PM, Butler A, Selbie J, Mahmood K, McKeown N B, Ghanem B, Msayib K, Book B, Walton A, (2007) 'The potential of Organic Polymer-Based Hydrogen Storage Materials'. **Phys.Chem**. 9 (15) p1802-1808.

David WIF, Jones MO, Gregory DH, Jewell CM, Johnson SR, Walton A, Edwards PP (2007) 'A Mechanism for Non Stoichiometry in the Lithium Amide/Lithium Imide Hydrogen Storage Reaction'. **J.American. Chem.Soc**, 129 (6) p1594-1601

Ghanem BS, Msayib KJ, McKeown NB, Harris KDM, Pan Z, Budd PM, Butler A, Selbie J, Book D, Walton A, (2007), 'A Triptycene-based Polymer of Intrinsic Microporosity that Displays Enhanced Surface Area and Hydrogen Adsorption'. **Chem.Com** (1), p67-69.

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Y.Pivak, R.Gremaud, K.Gross, M. Gonsalez-Silveira, A.Walton, H.Schreuders, B.Dam and R.Griessen. (2009) 'Effect of the film substrate on the thermodynamic properties of the PdHx studied by hydrogenography', **Scripta Materialis**, Vol 60, Issue 5, p348

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