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Professor Colin Greaves MA, DPhil, CChem, FRSC, FInstP

Professor of Materials Chemistry

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About

Colin Greaves is Professor of Materials Chemistry and has been actively researching the synthesis and characterisation of new Functional Inorganic Materials for many years. Colin has published over 200 papers in refereed journals and his research has been funded by UK research councils, EU and industry. Colin is currently exploring approaches to incorporate (and control) mixed conductivity in materials (targeting Solid Oxide Fuel Cell electrodes), and probing how naturally occurring minerals may shed light on the synthesis of new materials with interesting properties, *e.g.* structural, magnetic, electronic and thermoelectric.

Qualifications

- DPhil (Chemistry, Oxon)
- MA (Chemistry, Oxon)
- BA (Chemistry, Oxon)

Biography

Colin Greaves obtained his BA at Oxford and, after spending a short time in Germany, studied for his DPhil in Oxford under the supervision of Brian Fender. He then spent five years undertaking industrial research before his appointment to a lectureship in the School of Chemistry at Birmingham. During his time at Birmingham, he has seen the Materials Chemistry group evolve into one of the strongest and broadest in the UK. He is particularly interested in the synthesis of new materials, often involving novel synthetic strategies, and the control of composition and structure to achieve particular property targets.

Colin was elected to a Fellowship of the Royal Society of Chemistry in 1996, and a Fellowship of the Institute of Physics in 1999. He received the RSC Medal and Award in Solid State Chemistry in 2001.

Colin was Chair of the Editorial Board of *RSC - Journal of Materials Chemistry* from 1998 – 2002. He was appointed to Chair of the RSC Solid State Group for the period 2002 – 2005

Teaching

Teaching Programmes

- Chemistry of d-block elements (Level C)
- Solid state chemistry of p-block elements (Level I)
- Defects, non-stoichiometry and superconductivity (Level H)

Postgraduate supervision

- Electrode and electrolyte materials for solid oxide fuel cells
- Synthesis, electronic and magnetic properties of low dimensional materials
- Materials derived from mineral structures

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Research

RESEARCH THEMES

Solid State & Materials Chemistry – High Temperature Superconductivity; Functional Materials: Structures and Electrical/Magnetic Properties of Mixed Metal Oxides, Oxide-Fluorides and Oxide-Oxyanion Phases; Electrolytes and Electrodes for Solid Oxide Fuel Cells; Materials derived from mineral structures.

RESEARCH ACTIVITY

Materials derived from mineral structures.

Current activity focuses on the signposts that naturally occurring minerals can offer for the synthesis of new materials with interesting properties. The synthesis and chemical control of new materials containing one-dimensional chains of cation polyhedra are being investigated. These studies are focusing particularly on the chemical aspects relating to magnetic order, electronic properties and possible cation charge order. We have successfully replicated the synthesis of mineral oxide sulphides with

related chain structures and demonstrated the successful substitution of cations to provide new materials with unusual magnetic properties.

Electrolytes and Electrodes for Solid Oxide Fuel Cells

Current activity explores the possible enhancement of ionic conductivity in oxides *via* the introduction of oxyanion species into the structural framework. This has potentially important applications for both electrodes and electrolytes. Layered oxygen-deficient and oxygen excess Ruddlesden-Popper phases are also under investigation as possible electrode materials with high stability and high electronic and ionic conductivities.

Oxide-fluorides

The Greaves Group has a long-standing interest in the use of fluorine substitution and insertion to modify the properties of transition metal oxides. This work is continuing with the aim of clarifying the nature of unusual structural effects that occur in the resulting oxide fluoride phases

Other activities

- Professor Greaves is currently an elected member on the Royal Society of Chemistry Materials Chemistry Council.

Publications

- Laguna-Bercero, M.A.,Kinadjan, N., Sayers, R. El Shinawi, H., Greaves, C.and Skinner, S.J. (2011), Performance of La2-xSrxCo0.5Ni0.5O4±δ as an Oxygen Electrode for Solid Oxide Reversible Cells, Fuel Cells, 11, 102-107., 11, 102-107.
- Hervoches, C.H., and Greaves, C., (2010), Crystal structure and oxide ion conductivity in cubic (disordered) and tetragonal (ordered) phases of Bi25Ln3Re2O49 (Ln = La, Pr). J Mater Chem, 20: 6759-6763.
- El Shinawi, H., Marco, J.F., Berry, F.J. and Greaves, C., (2010), LaSrCoFeO5, LaSrCoFeO5F and LaSrCoFeO5.5: new La-Sr-Co-Fe perovskites. J Mater Chem, 20, 3253-3259.
- El Shinawi, H. and Greaves, C., (2010), Synthesis and Characterisation of La1.5+xSr0.5-xCo0.5Ni0.5O4±δ. J Mater Chem, 20, 504-511.
- Zhou, T., Zhang, D., Button, T.W., Berry, F.J. and Greaves, C., (2010), Substitution effects on the structure and magnetic behaviour of Na0.63CoO2. Dalton Trans, 39, 1089-1094.
- Headspith, D.A., Sullivan, E.C., Greaves, C. and Francesconi, M.G., (2009), Synthesis and Characterisation of the Quaternary Nitride-Fluoride Ce2MnN3F2-d. .Dalton Trans, 42, 9273-9279

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