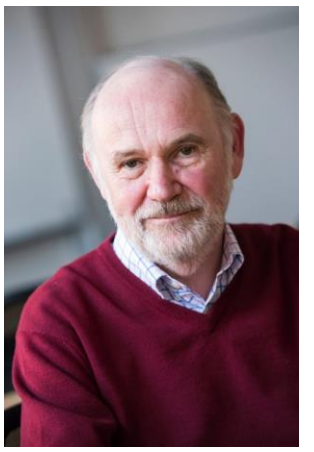
I²CNER Webinar

International Institute for Carbon-Neutral Energy Research (WPI-I²CNER)
Kyushu University

Title Optimising Ion Transport in Ceramics for Energy Conversion and Storage Applications



Speaker Prof. John A. Kilner

Department of Materials, Faculty of Engineering, Imperial College London, UK

Time& Date 5:00 PM(JST), Wednesday, April 6th, 2022

Abstract

High temperature solid state electrochemical devices for the conversion and storage of energy, such as solid oxide fuel cells and electrolysers, rely upon the transport of mobile ionic species in both the electrolyte and the electrodes. For volume production of these devices, the fabrication of ceramic oxide materials is the most cost-effective route. It is thus essential to understand how to optimise ion transport within the lattice of the oxide and across, and/or along, the interfaces in the ceramic material.

In this presentation we will see how to optimise oxygen ion transport in materials for Solid Oxide Cells (SOCs) by considering the two important parts. First we will take a historical perspective and we will examine the optimisation of lattice transport by examination of the example of the fluorite structured electrolyte materials and the perovskite structured electrolyte and electrode materials. This will include an examination of optimum substitution strategies to promote mobile lattice defects and how this has been developed over the years. Second, we will then look at the effect of interfaces on ion transport, in particular grain boundaries, how they can have a detrimental effect on overall transport rates in ceramic electrolytes and how they can be used to boost the performance of selected electrode materials.

About the Speaker

John Kilner gained his PhD in physical metallurgy from Birmingham University in the UK and joined Imperial College London in 1979 as Wolfson Research Fellow. In 1995 he was appointed Professor of Materials Science and in 2006, BCH Steele Professor of Energy Materials. He also holds appointment as a consultant at CIC Energigune in Vitoria, Spain where he headed the Ceramic Electrolyte group and he is a Principal Investigator at the International Institute for Carbon Neutral Research (WPI-I²CNER) in Kyushu, Japan where he works on high temperature electrochemical devices.

John has over 40 years experience in the measurement of mass transport and surface properties of ceramic materials for Solid Oxide Fuel Cells (SOFCs), Solid Oxide Electrolysers (SOEC's), Ceramic Oxygen Generators (COGs) and solid state Li batteries using ion beam based techniques as a major characterization tool. He has published over 500 papers on topics as diverse as the development of Secondary Ion Mass Spectrometry (SIMS), ion beam modification of materials, silicon on insulator technologies, Ni superalloys and, most extensively, in solid state ionics related to energy conversion and storage. He is currently the European editor of the Journal Solid State Ionics.

During his career he has worked closely with industry including companies such as Air Products and Chemicals, Allied Signal, Praxair and he is a co-founder of the AIM listed company Ceres Power Ltd, a world leading company in the development of metal supported Solid Oxide Fuel Cell (SOFC) technology.

John has received many awards for his work. He was awarded the European Fuel Cell Forum Schönbein Gold Medal and the Verulam medal of the IOMMM in 2004, in 2005 he was the recipient of the Royal Society Armourers and Braziers Award. In 2012 he was awarded the Platinum Medal of the IOMMM and he led an international team from the UK, Spain, the US and Japan, that won the International Union of Materials Research Societies Somiya Award for international collaboration. In 2016 he and his team of collaborators was awarded the Daiwa Adrian award for Anglo Japanese collaborative work and in 2017 for his services to Imperial College he received the Imperial College Medal. He is a Fellow of both the Institute of Physics and the Institute of Mining Minerals and Metallurgy and in 2007 he was made a Fellow of the City and Guilds Institute of London.

Registration https://zoom.us/webinar/register/WN_svZ2CKZnTw-En4kPK-27lw

Host Prof. Hiroshige Matsumoto

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