METCO

metrology of electro-thermal coupling

High Temperature Piezoelectrics

Materials and Measurement Workshop

25th January 2015 10:00 – 16:00

Hotel Bellevue, Maribor, Slovenia

Piezoelectric actuators and sensors are widely used for flow control valves, including diesel injectors and pneumatics, sound and ultrasound generation, optical fibre positioning, printing, and pumps. Degradation of material and electrical properties at high temperature means that these applications are typically limited to operating temperatures of around 200 °C or below. There are many applications in sectors such as automotive, aerospace, power generation and process control, oil and gas, where the ability to operate at higher temperatures would open up new markets for piezoelectric actuation.

This free to attend workshop on high temperature piezoelectric materials and measurement , will provide in-depth coverage of high temperature piezoelectric measurements including resonance and interferometry, comparison of measurement methods, uncertainties and best practice. It will also cover developments in high temperature piezoelectric materials from research and industry perspectives.

Piezo 2015 Electroceramics for End-Users VIII

The PIEZO 2015: Electroceramics for End-users VIII conference is dedicated to advances in electroactive, particularly piezoceramic, materials and devices. It presents the latest piezoelectric and multifunctional materials, technologies and devices research and development, bringing together the international community within the field for discussion and networking. It will include a professional exhibition. The conference will be held in the hotel Bellevue, situated in the ski-centre Mariborsko Pohorje, at the outskirts of Maribor, the second largest city in Slovenia. Full details of the conference can be found at www.piezo2015.com.

Register for free: metco@npl.co.uk

The workshop is jointly organised by the European Metrology Research Programme (EMRP) project METCO and the Piezo Institute.

Piezo INSTITUTE
The European Institute of Piezoelectric Materials and Devices

EMRP
European Metrology Research Programme
Programme of EURAMET

The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Agenda:

10:00 - 10:15	**Welcome and overview - materials, applications and metrology challenges**	Paul Weaver	National Physical Laboratory (NPL)
10:15 - 10:45	**High temperature piezoelectric materials**	Tim Stevenson	University of Leeds
10:45 - 11:00	Coffee break	Tim Stevenson	University of Leeds
11:00 - 11:30	**High temperature resonance measurement**	Paul Weaver	NPL
11:30 - 12:00	**High temperature Jamin interferometer for piezoelectric measurements**	Peter Woolliams	NPL
12:00 - 12:30	**Full-field precision interferometry for measuring temperature dependence of length, strain and thermal-expansion in piezoelectric materials**	Guido Bartl	Physikalisch-Technische Bundesanstalt (PTB)
12:30 - 13:30	Lunch		
13:30 - 14:00	**Industry view - commercial high temperature interferometers for bulk and thin film measurement**	Thorsten Schmitz-Kempen	aixACCT Systems GmbH
14:00 - 14:30	**Measurement comparisons and results summary**	Paul Weaver	NPL
14:30 - 14:45	Coffee break		
14:45 - 15:15	**$BiFeO_3$-Based Piezoelectric Ceramics: Processing and Electro-Mechanical Properties**	Tadej Rojac	Jožef Stefan Institute
15:15 - 15:45	**Industry view - commercialisation of high temperature piezoelectric materials**	Tim Comyn	Ionix Advanced Technologies Ltd
15:45 - 16:00	Summary and close	Paul Weaver	NPL

Biographies:

Dr. Paul Weaver

Dr. Weaver works in the Functional Materials group at NPL and is the co-ordinator of the METCO project. The functional materials group at NPL (the UK's national measurement laboratory) work on the measurement and materials science of piezoelectric, ferroelectric and multi-functional materials for sensing, actuation, and energy applications, particularly for harsh environments. NPL's role in METCO is to develop high temperature interferometry and resonance measurement methods. Paul graduated with an MA degree in natural science from Cambridge University, and a PhD from Southampton University. He has over 15 years' industrial experience in research, development and applications of functional materials.

Peter Woolliams

Peter is also working in the NPL Multifunctional Materials Group on the use and application of piezoelectric and ferroelectric materials. Peter has extensive experience in optics and photonics measurements. Peter graduated in Physics from Imperial College, London. He is a Chartered Physicist and Member of the Institute of Electrical and Electronic Engineers.

Dr. Tim Stevenson

Dr. Tim Stevenson is a Research Fellow within the Institute for Materials Research at the University of Leeds where his research interests include developing piezoelectric materials, measurement and metrology for extreme environment sensing and actuation. He holds a Ph.D in Materials Science and Engineering, and is tasked with supplying the METCO project partners high temperature piezoelectric materials for evaluating their new metrology techniques, as well as developing novel ceramic systems that offer reliable and reproducible high temperature properties to act as material standards. Tim is an active member of the Institute of Materials, Minerals and Mining (IOM3) and IEEE, and in 2011 was awarded gold for 'early research career' engineer at SET for Britain, Westminster for impact on UK research.

Dr. Guido Bartl

Dr. Bartl works in the department "Interferometry on Material Measures" at the Physikalisch-Technische Bundesanstalt (the national metrology institute of Germany). He received his Dipl.-Phys. degree from the Carl-von-Ossietzky University, Oldenburg, Germany, in 2006 and the Ph.D. degree from the Technical University of Braunschweig, Germany, in 2010. The work in the department is focussed on the interferometric length measurement of gauge blocks and other plane parallel material measures. Based on length measurements at different temperatures (between 10 K and 490 K) the coefficient of thermal expansion is characterised. PTB's role in METCO is to develop high temperature imaging interferometry for the characterisation of piezoelectric materials.

Dipl.-Ing. Thorsten Schmitz-Kempen

Dipl.-Ing. Thorsten Schmitz-Kempen received his diploma in 1998 from the faculty of Electrical Engineering and Information Technology, from the RWTH Aachen University of Technology, Germany. He has worked at the Department of Materials in Electrical Engineering II and is co-founder of the aixACCT Systems GmbH. He is responsible for the development of new test equipment at aixACCT and has designed the first 200 mm and high speed double beam laser interferometer. His research interests are characterisation techniques utilizing optical measurement methods and piezoelectric characterization. Mr. Schmitz-Kempen is active in the field of oxide thin film testing since 18 years and designs test equipment for piezoelectric materials and other industrial test systems since more than 12 years.

Tadej Rojac

Tadej Rojac received his B.Sc. in 2003 in Chemical Engineering and a Ph.D. degree in 2007 in the same field from the University of Ljubljana, Slovenia. In 2009 he performed a one-year postdoctoral study at the Swiss Federal Institute of Technology in Lausanne, Switzerland. Since 2000 he has been working as a researcher at the Electronic Ceramics Department of the Jozef Stefan Institute in Ljubljana, Slovenia. His main research interests cover mechanochemical reaction mechanisms, application of the mechanochemical processing in the synthesis of complex ceramic oxides, and processing-structure-properties relationship in lead-based and lead-free piezoelectric ceramics and thick films. From 2013 he is an Asst. Prof. at the Jozef Stefan International Postgraduate School. He is author and co-author of 25 scientific papers, 3 review papers, 3 chapters in monographs and 1 patent.

Tim Comyn

Since gaining his PhD in 1998, Tim has been involved predominantly in the design and characterisation of new materials, specifically, high temperature piezoelectric and multiferroic systems based on bismuth ferrite, and applications based on these systems. Tim took the role of Chief Technical Officer of Ionix in 2012, to exploit the high temperature piezoelectric materials, HPZ, developed at the University of Leeds, UK. Ionix, which received a venture capital investment in 2013 and 2014, is developing devices and technologies to exploit HPZ in extreme environments where conventional materials such as PZT have limitations.

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