METCO

metrology of electro-thermal coupling

High Temperature Piezoelectrics

Materials and Measurement-Industry Workshop

6th May 2015 09:30 – 16:00

National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW, UK

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.

The METCO project, funded under the European Metrology Research Programme, was set up to develop traceable metrology and measurement tools for the characterisation of piezoelectric materials at elevated temperatures.

This workshop is free to attend and will provide an overview of developments in the project, including: in-depth coverage of high temperature piezoelectric measurements, piezoelectric resonance and interferometry measurements at high temperatures, comparison of measurement methods, uncertainties and best practice.

Time has been allocated for an open discussion and networking to develop a view of current requirements and future trends in this field.

Registration: contact 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:

09:30 - 10:00	Registration & Coffee		
10:00 - 10:15	**Welcome and overview of project**	Paul Weaver	NPL
10:15 - 10:45	**High temperature piezoelectric materials**	Tim Stevenson	University of Leeds
10:45 - 11:15	**High temperature Interferometry & temperature rise**	Peter Woolliams, Alex Blumfield & Maksim Sphak	NPL/MIKES
11:15 - 11:35	Coffee break		
11:35 - 12:05	**Full-field precision interferometry for measuring electro- and thermo-mechanical strain**	Guido Bartl / Tatjana Quast	Physikalisch-Technische Bundesanstalt (PTB)
12:05 - 13:05	Lunch		
13:05 - 13:35	**Commercial high temperature interferometer for bulk and thin film measurement**	Thorsten Schmitz-Kempen	aixACCT Systems GmbH
13:35 - 14:05	**High temperature resonance measurement**	Paul Weaver	NPL
14:05 - 14:35	**Measurement comparisons and results summary**	Paul Weaver	NPL
14:35 - 15:05	**Discussion & Industry Feedback**	ALL	
15:05 - 15:35	**Lab Tour**	ALL	
15:35 - 15:50	Conclude / Coffee break		

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.

Alex Blumfield

Alex Blumfield is working within the Functional Materials group at NPL primarily on the METCO high temperature interferometer. Alex graduated with an MEng degree from the University of Bath.

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.

Dr. Tatjana Quast

Dr. Tatjana Quast is currently working as a post- doctoral researcher at PTB's department Interferometry on Material Measures, where she focuses on interferometric length measurement of functional materials. In 2007, she received her dipl. Phys. degree from the Julius-Maximilians Universität of Würzburg, Germany. In 2012, she received her Ph.d. degree from the department of Physical chemistry, also at the Universität Würzburg, for her work on polarization pulse shaping of femto-second laser pulses and ultrafast time-resolved spectroscopy of charge-transfer systems. Her research interests include the development of optical measurement techniques and their application to material systems.

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.