METCO

metrology of electro-thermal coupling

METCO Newsletter

January 2014 Issue 1

Welcome to the METCO newsletter

With the start of the new year, I would like to welcome you to the start of our new METCO newsletter. Starting now, we will be producing a 6-monthly newsletter to keep you abreast of the development of our work in high temperature piezoelectric measurements and electrocaloric cooling. We welcome feedback and input to our work from industry, academia or other interested parties. Please use the contact details on this page to get in touch. On behalf of the METCO team, I would like to wish you a happy and successful new year.

Paul Weaver, METCO Co-ordinator

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About METCO

- High temperature piezoelectric materials for automotive, energy, process, electronics and medical industries
- Electrocaloric cooling for "clean" refrigeration

Reliable measurement is essential to provide the data required for the development of new materials technology, effective design of new devices, reliability in characterisation and test, and to ensure quality in manufacture and reliability in service. METCO will develop the metrological infrastructure and facilities within Europe for the traceable metrology of piezoelectric, ferroelectric, thermal, and electro-caloric properties at high temperatures and electric fields.

Get involved

Successfully developing new high temperature piezoelectric and electro-caloric technologies requires industry input and multidisciplinary expertise in applications, materials science, device engineering, metrology and instrumentation. For more information see our website at: http://projects.npl.co.uk/METCO

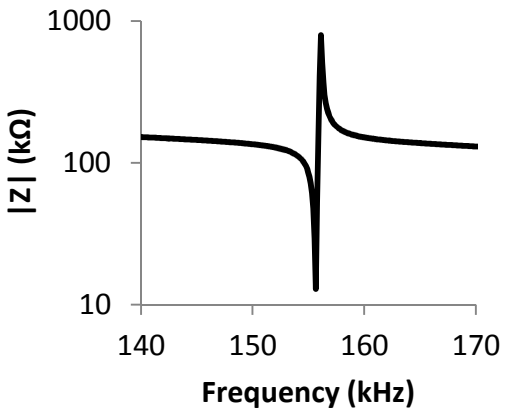
If you would like to get involved with the project and receive regular updates, please contact: metco@npl.co.uk

EMRP
European Metrology Research Programme
Programme of EURAMET

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

New resonance measurement system installed at NPL

A new resonance measurement facility has been installed at NPL with initial results demonstrating measurement of piezoelectric resonance at 793 °C using the quartz analogue material gallium orthophosphate ($GaPO_4$). Work is now under way to characterise the system to ensure measurements are quantified and traceable to SI units. We will be using the system to investigate the temperature dependence of the piezoelectric effect in a range of industrially important materials including high Curie temperature ceramics. The facility also has the capability to apply mechanical load and DC electrical bias.

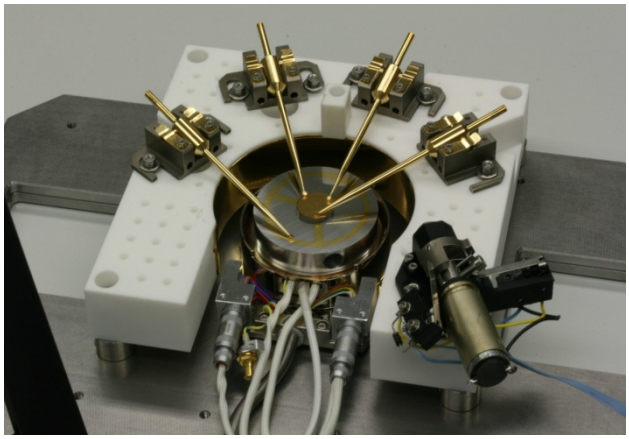


Piezoelectric resonance in gallium orthophosphate measured at 793 °C

New sample environment for PTB's ultra-precision interferometer: upgrade complete

High-accuracy multi-wavelength imaging interferometry is a technique which allows one to measure the absolute length and height topography of a sample very accurately. It is also possible to derive quantities like the coefficient of thermal expansion from the measured lengths at different temperatures.

For piezoelectric strain measurements at elevated temperatures, PTB developed a sample environment for their ultra-precision interferometer which allows one to heat the sample (up to 200 °C) and to apply an electric field (up to 2 kV mm^{-1}).



Sample mount for the PTB interferometer with three-point support and fastening clamps

The sample is placed on a three-point support on a reference plate which rests on a heating module. Metal fastening clamps with a small clamping force prevent the sample from moving without constraining it considerably. At the same time, they act as a high-voltage supply to apply the electric field to the sample. Thermal shielding prevents heat loss via heat conduction and radiation and protects the optical components in the interferometer from damage caused by heating.

With this novel sample environment, the ultra-precision interferometer is a suitable facility for the traceable measurement of piezoelectric strain at elevated temperatures.

METCO at National Instruments Week 2013, held in Austin, Texas

Dr Tim Stevenson, University of Leeds, accepted an invitation to present the METCO project at the Academic Forum at NI Week 2013, held in Austin, TX by National Instruments in August. The conference, predominantly industrially led, highlights the applications and projects internationally that employ NI hardware and software in integrated systems, particularly in robotics where high temperature piezoelectrics are expected to have a significant impact.

METCO and 100 years of Bragg diffraction

The METCO project was featured in the University of Leeds Impact Magazine, which this year celebrated 100 years of Bragg diffraction and presented case studies where crystallography has made contributions to modern research, in particular ferroelectrics. The newsletter can be downloaded from here: www.leeds.ac.uk/downloads/file/1318/issue_8-summer_2013

Dr. Tim Stevenson featured in the University of Leeds Impact magazine

New PhD studentship to develop electrocaloric cooler

Maciej Rokosz has been appointed to a joint research studentship with NPL and Imperial College, London (Neil Alford and Andrey Berenov) to develop a prototype cooler exploiting the electrocaloric effect. Maciej will be working closely with the METCO project in the application of the metrology of the electrocaloric effect and the electrocaloric figure of merit.

New testing capabilities development by industry partner aixACCT

aixACCT Systems as the project's industry partner has developed new products for high and low temperature electromechanical testing of piezoelectric ceramics with the help this project. Their latest sample holders allow testing down to -100°C and up to 600°C with a design integrated in their current product line of aixPES Piezoelectric Evaluation Systems. In the latest design it can even reach up to 800°C fulfilling increasing demand from industry for high temperature testing.

aixACCT high temperature sample holder