Introduction to the EMRP THERMO (Metrology for Thermal Protection Material) Project

Presented by: Jiyu Wu (NPL)

12th May 2016

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

EURAMET EMRP

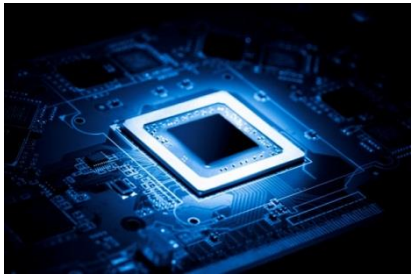
- EMRP supports the collaboration of European metrology institutes, industrial organisations and academia through Joint Research Projects (JRPs). It is structured around European Grand Challenges in such areas as Health, Energy, the Environment & New Technologies.

- The follow on programme is EMPIR. The last call for proposals has just closed. See www.euramet.org for more details.

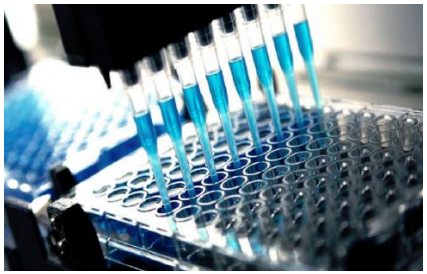
SI Units (2011 & 2012)

Environment (2010 & 2013)

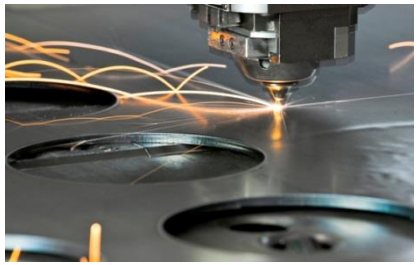
Energy (2009 & 2013)



New Technologies (2011)



Health (2011)



Industry (2010 & 2012)

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Presentation Outline

- Overview
- Objectives
- Work Packages
- Progress/Achievements

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Overview

- EMRP JRP: **Metrology for Thermal Protection Materials** (SIB52)
- Project schedule: 1 June 2013 to 31 May 2016
- Funded partners:

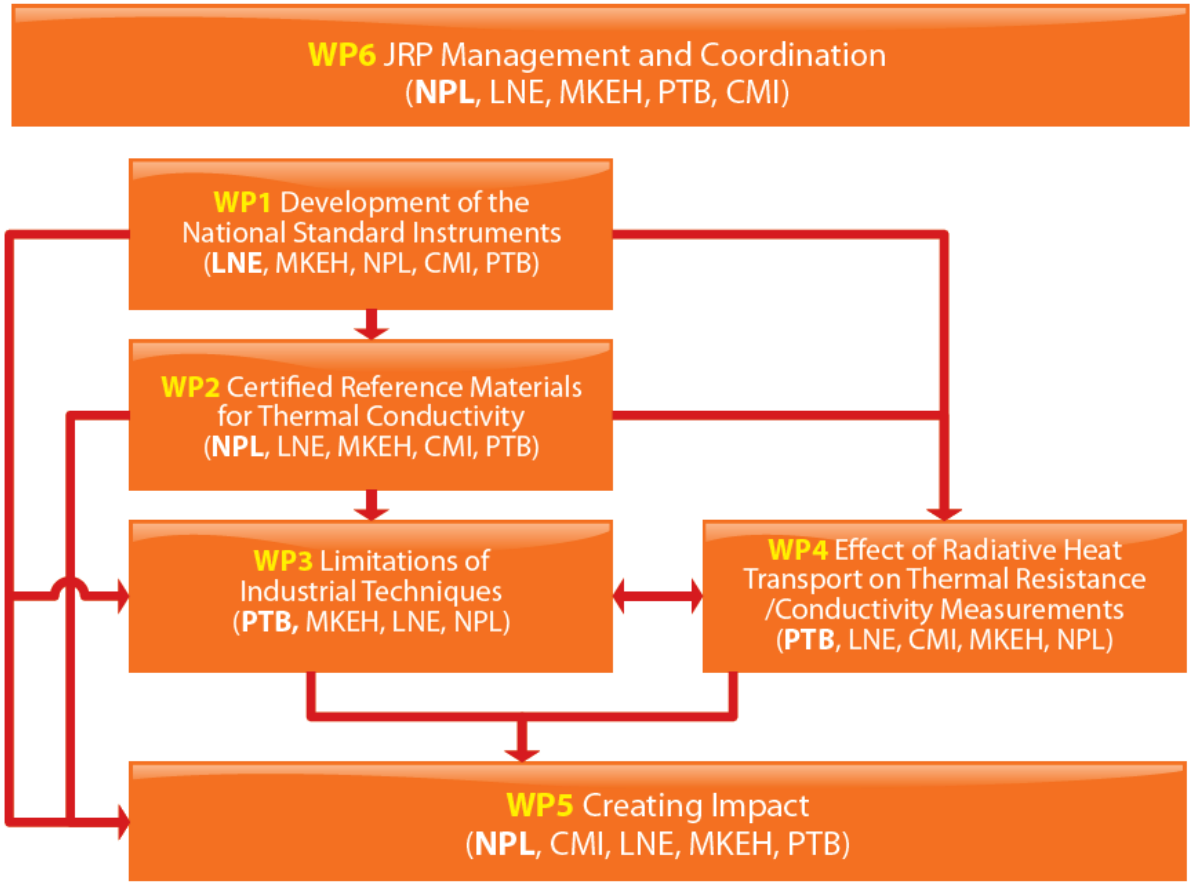
- Collaborators include:

Objectives

- Establish a complete traceability chain for characterising thermal performance of advanced thermal protection materials.
- Achieve three times better European equivalence in thermal conductivity measurements up to 800°C (revised to 650°C).
- Evaluate the viability for improving industrial measurement techniques up to 800°C (revised to 650°C).

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Work Packages



Project Website: http://projects.npl.co.uk/thermo/

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Highlights in WP1

New and/or upgraded National Standard facilities for measuring thermal conductivity of insulation at high temperatures

- LNE upgraded in-house built HTGHP
- CMI new in-house built HTGHP
- MKEH new in-house built HTTCMA
- NPL upgraded HTGHP and LTGHP, new SGHP

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Highlights in WP2

- A new method has been developed in the project, which combines both thermal metrology and material science in the assessment of candidate high temperature thermal conductivity reference materials. It enables science to go beyond what could be achieved separately.

- NPL presented a paper titled ‘Provisional Assessment of Candidate High Temperature Thermal Conductivity Reference Materials in The EMRP ‘Thermo’ Project’ at the 32nd International Thermal Conductivity Conference that was held at Purdue University, Indiana, USA. The paper is in the process of publication.

- 15-off out of 76-off HDCaSi-N14 specimens have been selected and prepared for Round-Robin and Star-shape inter-comparisons in the Thermo project.

- All the inter-comparisons using HDCaSi-N14 are in progress, expect to complete in June 2016.

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Highlights in WP3

- PTB and all other funded partners co-authored a peer-reviewed paper “Critical Review of Industrial Techniques for Thermal-Conductivity Measurements of Thermal Insulation Materials” that was published in Int. J. Thermophys in Apr. 2015.

- LNE wrote a review report on the application of the laser flash technique to anisotropic materials.

- The protocol for the Star-shape inter-comparison has been agreed and the comparison is in progress

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Highlights in WP4

- PTB is leading the investigation of the effect of radiant heat transfer on thermal resistance/conductivity measurements, aiming at temperatures up to 800 °C. The effect of radiative heat transport on thermal conductivity measurements using a GHP was investigated in several studies.

- LNE has performed normal hemispherical spectral transmittance and quasi-normal hemispherical reflectance measurements on five thin high-temperature insulation samples at room temperature. The study has shown that it is possible to obtain experimentally radiative properties data on high temperature insulation materials.

- Based on the research in the Thermo project, CMI, LNE and PTB delivered four co-authored presentations and posters at the Nineteenth Symposium of Thermophysical properties in Boulder CO, USA in June 2015.

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Highlights in WP5 & WP6

Report	JRP Target	No. of items reported
STANDARDS (Recommendation to TC89)	1	7+
PUBLICATIONS (Journal & Proceedings)	6	9
CONFERENCE PRESENTATIONS & POSTERS	5	18
TRAINING (external & internal)	6	10
TRADE JOURNAL ARTICLES	2	1
STAKEHOLDER MEETING	2	2

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Q/A

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union