VAMAS

Modulus Measurements
Work Area 32

Validation of the test method for the measurement of the tensile elastic modulus

Background

The need for improved elastic modulus measurement was highlighted in the CIPM Working Group on Materials Metrology report that found extremely poor reproducibility in tensile elastic modulus proficiency testing.

This poor reproducibility was also encountered during the certification of the existing BCR 661 reference material. This material has been produced to serve as a tensile reference material, and based on an interlaboratory exercise it has been assigned several tensile testing related certified values (proof stresses, elongation at fracture, reduction in area at fracture, tensile strength). However, the obtained elastic modulus values were not sufficiently reliable to serve as a certified value (an indicative value with a relatively large uncertainty is provided instead).

Standardization Needs

Standards EN10002-1 and ASTM E8 focus predominantly on measuring the full stress-strain curve. ASTM E111 covers elastic modulus measurement in more detail, but there are still issues with aspects of strain measurement and data analysis, which need to be resolved.

Recommendations from an EU funded project (TENSTAND) included the development of a separate dedicated tensile test for elastic modulus, but further groundwork and lobbying of the relevant standards committees is required to gain support. The collaborative project to examine aspects of the procedures and test methodology will be a valuable development.

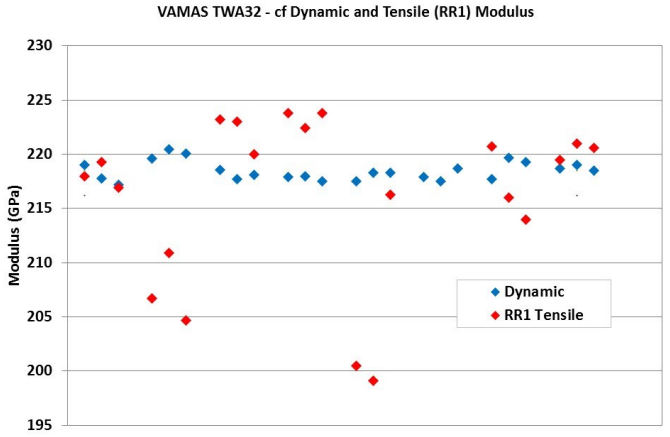
Deliverables

- VAMAS technical report on the interlaboratory comparison exercise
- Draft text for submission to an international standards development organization

MORE PARTICIPANTS WELCOME

Work Programme

Activity	2015								2016				
	M	J	J	A	S	O	N	D	J	F	M	A	M
Source further material from IRMM													
RR2 - Tests on round specimens													
Examine effect of Preloading/prestrain													
Examine the effect of machine/operator variability													
RR3 - using a single set of specimens													
Finalise test protocol													
RR4 - repeat exercise using agreed protocol													
Meeting & Report, incl presentation to VAMAS SC													



Measurement Traceability

Through the MoU between BIPM (www.bipm.org/) and VAMAS, it is hoped an interaction will be developed with the Consultative Committees on length (CCL) and mass (CCM) to ensure best practice and traceability of the prime measurements made in elastic modulus tests.

Funding

Participation is based on in-kind effort by the partners.

Phase 1 Results

'Indicated' modulus value for BCR 661
E = 206.0 ± 21GPa

NPL dynamic modulus characterisation
E = 218.5 ± 0.9 GPa

Phase I Tensile modulus
E = 215.5 ± 8.0 GPa

- Inherent variability in the BCR 661 reference material
- Initial data is looking very promising (reduced uncertainty)

For more information:

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