PROJECT

SURFCHEM - TRACEABLE QUANTITATIVE SURFACE CHEMICAL ANALYSIS FOR INDUSTRIAL APPLICATIONS

URL

http://www.emrp-surfchem.bam.de

DURATION

2011 - 2014

PROJECT TYPE

EMRP funded project (European Metrology Research Programme, EMRP), Project No. IND15SurfChem

SCOPE

The project addresses chemical and topographical metrology at surfaces. The new methodologies of measurements at surfaces will be developed as good practice guides and new work item proposals for industrial ISO standards.

OBJECTIVES

The objectives of the Joint research project (JRP) are to provide measurement standards and methods with traceability wherever it is practicable to do so for quantitative surface chemical analysis for industrial applications. This includes:

- The provision of new certified reference materials (CRMs) with known and stable surface chemistries as well as with defined thickness and lateral structure for instrument development and calibration as well as verification of industry-relevant surface chemical measurements.

- The provision of new fast non-destructive methods of quantitative surface chemical analysis for industrial in-line quality control. In particular, this will include the development of advanced techniques for real time, in-situ measurement of catalyst structure and activity on a localised scale to underpin the development of more efficient, selective and cost-effective catalysts.

- The provision of metrological methods including development of new CRMs to improve the capability and traceability of technologies widely used in industry for surface analysis such as electron and fluorescence spectroscopy, X-ray reflectrometry, electron probe microanalysis or ion mass spectrometry.

Two work packages deal with reference material and method development for industrial problems of inorganic and organic surface analysis. Analytical methods addressed are photoelectron and Auger electron spectroscopy, electron probe micro analysis, X-ray reflectrometry and secondary ion mass spectrometry. One work package is dedicated to the development of traceable fast non-destructive methods of quantitative surface chemical analysis for industrial in-line quality control with a focus on contamination on
food and high end products. Methods applied in the related tasks are optical methods as IR and Raman, atmospheric pressure secondary ion mass spectroscopy as DESI and wettability testing methods (WCA) as well. New advanced optical and SPM based techniques used for real time, in-situ measurement of catalyst structure and activity on a localised scale are specifically addressed by another work package.

CO-ORDINATOR

Bundesanstalt für Materialforschung und –prüfung (BAM)
Contact: Dr. Wolfgang Unger, Department 6 Materials Protection and Surface Technology
Email: Wolfgang.Unger@bam.de

PARTNERS

- Eidgenoessisches Justiz- und Polizeidepartement (EJPD), Switzerland
- Istituto Nazionale di Ricerca Metrologica (INRIM), Italy
- NPL Management Limited, United Kingdom
- Physikalisch-Technische Bundesanstalt (PTB), Germany
- SP Sveriges Tekniska Forskningsinstitut AB, Sweden
- Chalmers University of Technology, Sweden
- ION-TOF GmbH, Germany
- Kratos Analytical Ltd, United Kingdom
- Scienion AG, Germany
- SPECS Surface Nano Analysis GmbH, Germany
- Focus GmbH, Germany

OUTCOME

The results are published as a summary and a final report with full details on the EURAMET website.

https://www.euramet.org/research-innovation/search-research-projects/details/?eurametCtcp_project_show%5Bproject%5D=1115&eurametCtcp_project%5Bback%5D=511&cHash=f971cb35d6ae35a16b55f5e16ca0da85

PUBLICATIONS

ARTICLE (JOURNAL)


- G. Shard, *Detection Limits in XPS for more than 6000 binary systems using Al and Mg Kα X-rays*, *Surface and Interface Analysis*, *ECASIA special issue* 2014, 46, 9. DOI: 10.1002/sia.5406.


- Fischer, T ; Dietrich, PM; Streeck, C; Ray, S; Nutsch, A; Shard, A; Beckhoff, B; Unger, WES; Rurack, K, *Quantification of variable functional-group densities of mixed-silane monolayers on surfaces via a dual-mode fluorescence and XPS label*, *Analytical Chemistry*, 2015, 87, 2685-2692, DOI10.1021/ac5038501.


Kumar, N; Stephanidis, B; Zenobi, R; Wain, Aj; Roy, D, Nanoscale mapping of catalytic activity using tip-enhanced Raman spectroscopy, Nanoscale 2015, 7, 7133-7137, DOI: 10.1039/C4NR07441F.

PROCEEDINGS


TALK

A. Shard, Surface chemical analysis beyond the boundaries with cluster ions, NMAET (Nano-Molecular Analysis for Emerging Technologies) V, 2012, Teddington, UK.


A. M. Giovannozzi, A. Saverino, C. Lobascio, F. Pennecci, A.M. Rossi, New methodology for traceable measurement of specific organic species at industrially surfaces by optical methods, ECASIA 13 (15th European Conference on Applications of Surface and Interface Analysis), 2013, Sardinia, Italy.


A. Wain, Advances in Electrochemical Scanning Probe Microscopy for Mapping the Electro-activity of Nanostructured Surfaces, ECASIA 13 (15th European Conference on Applications of Surface and Interface Analysis), 2013, Sardinia, Italy.