2020-11-16

Project Plan for the CEN Workshop - OYSTER on Materials characterisation - Terminology, classification and metadata

Workshop
(Approved at the Kick-off meeting on 2020-11-05)

1. Status of the Project Plan

Project Plan approved at the kick-off meeting on 5th November, 2020

2. Background to the Workshop

2.1. General

Materials characterisation includes the identification and measurement of properties that are either intrinsic or manifest in a material. Characterization descrives those features of the composition, structure (including defects) and behaviour (either mechanical or functional) of a material, which are significant for a particular preparation, study of properties, or use, and suffice for reproduction of the material

Characterisation, besides experimentation and materials modelling, is regarded as one of the pillars supporting the development of new and advanced materials and their engineering and upscaling into new products. It has been demonstrated in many individual cases that materials characterisation is a key enabler of research and development efficiency and innovation and that the use of this technology can generate a huge economic impact. For example, in a survey by the Engineering & Upscaling Cluster carried out in 2015 on behalf of the European Commission DG RTD, characterisation was found to be applied by 95% of NMBP projects and method developments carried out by 50% of projects. It ranked 9/10 in importance as a methodology to support engineering and upscaling of materials.

Due to the huge variety and complexity of materials and the wide range of applications the materials characterisation field consists of many communities. These communities have established different terminologies which typically focus on specific application domains and on types of characterisation methods. Two broad categories of characterisation methods can be those used to identify the nature (structure, chemistry) of the material and those evaluating material performance. As a result, a wide range of domain specific characterisation methods have evolved. However, applications to industrial problems in advanced materials and nanotechnology require a strong interdisciplinary approach among these fields and communities. There is therefore a need to establish a common structured documentation of characterisation data (definition of concepts and vocabulary) in materials characterisation.

The CEN workshop will be based on Horizon 2020 EU project OYSTER[1] (Grant Agreement no. 760827), aiming at bringing OYSTER solution and results to market through standardisation.

The project is supported by the European Materials Modelling Council (https://emmc.info/) and European Material Characterization Council (http://www.characterisation.eu/)

2.2 Motivation for the CEN Workshop

A standardised terminology will improve future exchanges among experts in the entire area of materials characterisation, facilitate the exchange with industrial end-users and experimentalists and reduce the barrier to utilising advanced materials characterisation. The common language is expected to foster dialogue and mutual understanding between industrial end-users, equipment manufacturers, and academic researchers. Standardisation of terminology and classification has been identified as critical to collaboration in and dissemination of European research projects. In particular, standards will facilitate interoperability between methods and databases. The standardization is relevant for an integrated technological development and brings benefits for industrial end-users due to simplified and much more efficient communication in the field of materials characterisation.

The classification helps data interpreters by translating industrial problems into problems that can be analysed with characterisation methods. It assists workflow development where several methods can interoperate in addressing a specific end-user question.

In future, this standardised terminology and classification can be formalised into a taxonomy and an ontology of materials characterisation. Such an ontology will form the basis for formal metadata development with which methods and databases can be linked. These developments will support efficient solutions for materials characterisation, enhance the communication, dissemination, storage, retrieval and mining of data about materials characterisation and contribute to efforts for materials digitalisation. The CEN workshop will be based on EU project OYSTER results.

2.3 The market environment

Industry and R&D communities in the following fields have been considered as target groups that benefit from the implementation of a harmonized terminology and classification in materials characterisation: microelectronics, microsystem engineering, energy, photonics, tribology, tissue engineering and biomedical devices. Contact mechanics related problems, such as uncontrolled adhesion and friction of real surfaces with complex shape and geometries, hugely affects the products and their applications in these sectors. These problems arise from intertwined physicochemical properties of the mating surfaces and the interfaces between them. Characterisations of these surface and interface properties are important for reliability, reproducibility and the ability to design the interface with predictable performance.

[1] http://www.oyster-project.eu/

2.4 The legal environment

This topic is not concerned by any directive or national legislation.

The work is aligned to shortcomings recognised by the European Commission in the domain of industrial data

2.5 Existing standards and standard related activities and documents

The most important existing standards and CWA to be considered in the context of the proposed CEN/WS are those developed by CEN/TC 352 – Nanotechnologies (the following in particular) and those indicated in the following table, but no existing standard covers the scope of the future CWA:

CEN ISO/TS 80004	Nanotechnologies - Vocabulary Part 1: Core terms (ISO/TS 80004-1) Part 2: Nano-objects (ISO/TS 80004-2) Part 3: Carbon nano-objects (ISO/TS 80004-3) Part 4: Nanostructured materials (ISO/TS 80004-4) Part 5: Nano/bio interface (ISO/TS 80004-5) Part 6: Nano-object characterization (ISO/TS 80004-6) Part 7: Diagnostics and therapeutics for healthcare (ISO/TS 80004-7) Part 8: Nanomanufacturing processes (ISO/TS 80004-8)
EN ISO 14577-1	Metallic materials — Instrumented indentation test for hardness and materials parameters — Part 1: Test method
ISO 23718:2007	Metallic materials – Mechanical testing – Vocabulary
ISO 6929:2013	Steel products – Vocabulary
ISO 704:2009	Terminology work – Principles and methods

ISO 860:2007	Terminology work — Harmonization of concepts and terms
ISO 1087:2019	Terminology work and terminology science – Vocabulary
EN ISO 4499-4	Hardmetals — Metallographic determination of microstructure Part 4: Characterisation of porosity, carbon defects and eta-phase content
CWA 16762:2014	ICT Standards in Support of an eReporting Framework for the Engineering Materials Sector
CWA 17284:2017	CEN/WS MODA - Materials modelling - terminology, classification and metadata
CWA 17552:2020	CEN/WS NATEDA Engineering materials —Electronic data interchange—Instrumented IndentationTest Data
ISO/TR 11360	Nanotechnologies - Methodology for the classification and categorization of nanomaterials
ISO/TR 12802	Nanotechnologies - Model taxonomic framework for use in developing vocabularies - Core concepts
ISO/TR 14187	Surface chemical analysis — Characterization of nanostructured materials
ISO/IEC Guide 99:2007	International vocabulary of metrology — Basic and general concepts and associated terms (VIM)
ISO/WD TR 4499-5	Hardmetals — Metallographic determination of microstructure Part 5: Characterisation and measurement of miscellaneous microstructural features

2.6 Industrial requirements

Industry has multimodal requirements expected to solve complex physical measurements such as adhesion/friction. Several specimens will be measured by a variety of complementary techniques and it is expected that overall characterization and test of specimens will be sped up by these combined measurements. This may lead to reengineering multimodal instruments so that they seamlessly and simultaneously afford the required multimodality. A standardisation is paramount to enable these requirements.

3. Workshop proposers and Workshop participants

The proposer of this CEN Workshop is the OYSTER Consortium, in particular the Project Coordinator from University "Roma Tre" and the Consortia Partner Goldbeck Consulting Ltd:

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St John's Innovation Centre
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Associate Professor of Materials Science
University "Roma Tre"
Department of Engineering
Via della Vasca Navale 79
00146 Rome, Italy
marco.sebastiani@uniroma3.it

The potential participants to the CEN/WS are listed in Annex A.

4. Workshop scope and objectives

Standardisation is relevant for an integrated technological development. Particularly, early standardisation of terminology has been identified as critical in and to European research projects. The need for standardisation of terminology and metadata in materials characterisation (and for wider materials digitalisation in general) has been outlined in the European Materials Characterisation Council Roadmap (2018), on which this CWA is based. The workshop scope follows the footsteps of the CEN Workshop on Materials modelling terminology, classification and metadata (CWA17284). Similarly to the materials modelling field, the objective is to agree on a high level materials characterisation terminology, categorization and a framework for documentation. Hence, this CWA includes definitions of fundamental terms for the field of materials characterisation. The definitions categorisation of materials characterisation methods based on a relatively small number of fundamental aspects of any type of characterisation such as the sample (which include testing environment and length scale), probe, environment and property concepts, replacing the current situation of opacity of materials characterisation methods that make the field hard to access for outsiders.

Based on these categories, this CWA provides a systematic description and documentation of methods including the user case, method, raw data generation and analysis and post-processing of data: the “materials CHAracterisation DAta” (CHADA). This is similar to the Materials Modelling Metadata (MODA) The CHADA seeks to organise the information so that even complex characterisation workflows can be conveyed more easily and key data about the methods, raw data generation and analysis, and post-processing of data and their implementation can be captured. A template CHADA is described in order to guide users towards a complete documentation of material characterisation.

5. CEN Workshop programme

The deliverable of this Workshop consists of one CEN Workshop Agreement; it shall be drafted and published in English.

Anyone can comment on this Project Plan of the envisaged CWA. All comments received will be considered by the chairperson preliminary to the kick-off meeting of participants of the Workshop where each comment received shall be presented, discussed and resolved.

Due to the Covid-19 pandemic, the kick-off will most likely have to be organised online and the final meeting will be live. All interim meetings can be organized as virtual meetings.
Table 1 gives an overview of the planned tentative work schedule.

Table 1: Tentative CEN/WS programme

TASK	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19
Project Plan (Preparation + publication)																			
Self Assessment																			
Submission to CEN BT																			
Workshop announcement																			
Kick off meeting																			
Drafting CWA																			
Commenting phase[2]																			
Approval/Endorsement																			
Publication																			
Promotion																			

The time schedule is subjected to be modified in relation to the drafting process of the CWA and to the eventual decision on the submission of the document to 60-days commenting phase. However, the document needs to be finalized by M19 in coherence with EU OYSTER project timeline.

6. Workshop structure

This Workshop shall be led by a chairperson and in case of absence or unavailability, by a vice-chair. The Workshop secretariat is responsible for the management process of the Workshop.

Based on development of the activities carried out at CEN/WS level. Experts will agree on the possibility to create specific project teams, ad hoc groups, etc, addressing specific issues.

6.1 CEN Workshop Chairperson

The proposed Chair person to be confirmed at the Kick-Off meeting is:

Dr. Eng. Marco Sebastiani, Ph. D.
Associate Professor of Materials Science
University "Roma Tre"
Department of Engineering
Via della Vasca Navale 79
00146 Rome, Italy
marco.sebastiani@uniroma3.it

Chairman main responsibilities include:

- Chairing the CEN Workshop meetings.
- Representing the CEN Workshop in outside meetings in cooperation with CCMC and with the Workshop secretariat.
- Monitoring the progress of the CWA in line with the Project Plan.
- Managing the consensus building process.
- Interface with CEN/WS Secretariat and CEN Management Centre regarding strategic indications, external relationships, problems arising in the development of the CWA

6.2 CEN Workshop Vice-Chair

The Workshop vice-chair shall be appointed in the Kick-off meeting. The vice-chair shall support and assist in all responsibilities outlined for the chairperson. In the absence of the chairperson, the vice-chair will represent the CEN Workshop at outside meetings in cooperation with CEN/WS Secretariat and will interface with CCMC regarding strategic directions, problems arising, external relationships etc.

6.3 CEN Workshop Secretariat

The proposed CEN Workshop Secretariat is by UNI – Italian national Standard Body.
CEN Secretariat is providing the formal link to the CEN system. The following main activities will be carried out by the Workshop Secretariat:

- Organizing CEN Workshop plenary meetings,
- Producing CEN Workshop minutes and action lists,
- Forming the administrative contact point for CWA project,
- Managing CEN Workshop attendance lists,
- Managing CEN Workshop document registers,
- Following-up action lists,
- Assisting Chairperson in monitoring and following-up of electronic discussions – in case the CEN Workshop is mainly working by electronic means,
- Administrating the liaison with relevant CEN/TCs, if applicable.

The Secreteriat will also provide public dissemination of the CEN workshop and CWA, either via online tool (e.g. website, social media) and with dedicated seminars and workshops, exploiting liaison with international innovation community.

The proposed contact detail for UNI Secretariat is:
Adriano Ferrara
Innovation department
UNI Ente Italiano di Normazione
Via Sannio, 2
20137 Milano
+39 0270024221 adriano.ferrara@uni.com

7. Resource requirements

7.1 Costs of the CEN Workshop Secretariat

The administrative costs of CEN Workshop Secretariat will be covered by resources from the H2020 project OYSTER.

The copyright of the CWA shall be with CEN.

7.2 Participation and Registration Fee

The registration and participation at this CEN Workshop are free of charge; each participant shall bear their own cost for travel and subsistence.

7.3 Related activities, liaisons, etc.

While preparing this Project Plan no requirements for liaison or other related activities have occurred.

8. Related activities, liaisons, etc.

The CEN/WS will explore possible liaison with the following CEN/TC and CEN/WS:

- CEN/TC 352 – Nanotechnologies
- CEN WS/NATEDA
- CEN WS MODA

9. Contact points

Proposed Chairperson:
Dr. Eng. Marco Sebastiani, Ph. D.
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CEN-CENELEC Management Centre
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Annex A: Provisional list of potential interested participants

A provisional list of potential interested subjects is indicated here below.

Other interested stakeholders are welcomed to register for membership in accordance with the CEN Rules for CEN Workshops. New participants could join the WS in accordance with point 4.3.2 of CEN/CLC Guide 29 on CEN/CLC Workshop agreements expressing their interest by writing to adriano.ferrara@uni.com and elena.mocchio@uni.com

Company (H2020 Project/Testbed Project)	**Name[3]**
Real time nano CHAracterization reLatEd techNloGiEeS – CHALLENGES[4]	Università degli Studi Roma La Sapienza (Coordinator)
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces - OYSTER[5]	Cambridge Nanomaterials Technology Ltd (Project Partner) Bojan Boskovic bojan.boskovic@cnt-ltd.co.uk
European Commission JCR	Tim Austin Simon.AUSTIN@ec.europa.eu
Sheet metal forming testing hub FORMPLANET[6]	Fundacio Eurecat (Coordinator) Info@formplanet.eu
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces - OYSTER	Goldbeck Consulting Ltd. (Project Partner) Gerhard Goldbeck gerhard@goldbeck-consulting.com
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces - OYSTER	Innovation in Research and Engineering Solutions – IRES (Project Partner) Elias Koumoulos epk@innovation-res.eu
Intelligent Open Test Bed for Materials Tribological Characterisation Services – ITRIBOMAT[7]	Austrian Excellence Center for Tribology (Coordinator) Ivana Toth i-tribomat@ac2t.at
Open characterisation and modelling environment to drive innovation in advanced	IWM Fraunhofer (Project Partner) Adham Hashibon adham.hashibon@iwm.fraunhofer.de

[3] Representatives will be confirmed after PP publication
[4] https://cordis.europa.eu/project/id/861857
[5] http://www.oyster-project.eu/
[6] https://formplanet.eu/
[7] https://www.i-tribomat.eu/

Company (H2020 Project/Testbed Project)	Name[3]
nano-architectured and bio-inspired hard/soft interfaces - OYSTER	
GHz nanoscale electrical and dielectric measurements of the solid-electrolyte interface and applications in the battery manufacturing line - NanoBat[8]	KEYSIGHT TECHNOLOGIES GMBH (Coordinator) Ferry Kienberger ferry_kienberger@keysight.com
Process Analytical Technologies for Industrial Nanoparticle Production - NanoPAT[9]	IRIS TECHNOLOGY SOLUTIONS (Coordinator) Simona Neri sneri@iris.cat
Multimodal X-ray and Hyperspectral Thin-Film Nano-material Evaluation and Quality Imaging - NanoQI[10]	Fraunhofer FEP (Coordinator) info@nanoqi.eu
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces - OYSTER	National Technical University of Athens (Project Partner) Costas Charitides charitidis@chemeng.ntua.gr
Process Analytical Technology Tools for Real-Time Physical and Chemical Characterization of Nanosuspensions - PAT4Nano[11]	University of Galway (Coordinator) Alan Ryder alan.ryder@nuigalway.ie
In-line and Real-time digital nano-characterization technologies for the high yield manufacturing of Flexible Organic Electronics - RealNano[12]	Nanotechnology Lab LTFN - Aristotle University of Thessaloniki (Coordinator) Argiris Laskarakis alask@physics.auth.gr
Open innovation test bed for electrochemical energy storage materials - TEESMAT[13]	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES Philippe Azais Philippe.AZAIS@cea.fr
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces - OYSTER	University of Limerick Ehtsham U Haq Ehtsham.U.Haq@ul.ie

[8] https://www.nanobat.eu/
[9] https://cordis.europa.eu/project/id/862583/it
[10] https://nanoqi.eu/
[11] https://cordis.europa.eu/project/id/862413
[12] http://www.realnano-project.eu/
[13] https://www.teesmat.eu/

Company (H2020 Project/Testbed Project)	Name[3]
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces - OYSTER	Università Roma Tre Marco Sebastiani marco.sebastiani@uniroma3.it
Open characterisation and modelling environment to drive innovation in advanced nano-architectured and bio-inspired hard/soft interfaces – OYSTER	National Physics Laboratory Charles Clifford charles.clifford@npl.co.uk
EU DG Research and Innovation	YANARIS ORTESIA GARCIA Yanaris.ORTEGA-GARCIA@ec.europa.eu
European Materials Modelling Council[14]	
European Material Characterization Council[15]	

[14] https://emmc.info/

[15] http://www.characterisation.eu/

Annex B - Relevant links

https://www.cen.eu/work/areas/nanotech/pages/default.aspx
http://www.oyster-project.eu/
https://www.cen.eu/news/workshops/Pages/WS-2017-012.aspx
https://zenodo.org/record/2636609
https://www.sciencedirect.com/science/article/pii/S235249281930087X