European Commission

Materials Characterisation – Current Activities and Vision Beyond 2020

EuroNanoForum **Bucharest** 2019

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Research and Innovation

European Materials Characterisation Council Workshop – Bucharest 2019

Aims:

The EMCC seeks input from

1. Open Innovation Test Beds

2. Industry Stakeholders

How can developments in characterisation procedures and tools be better supported to accelerate the uptake of advanced materials.

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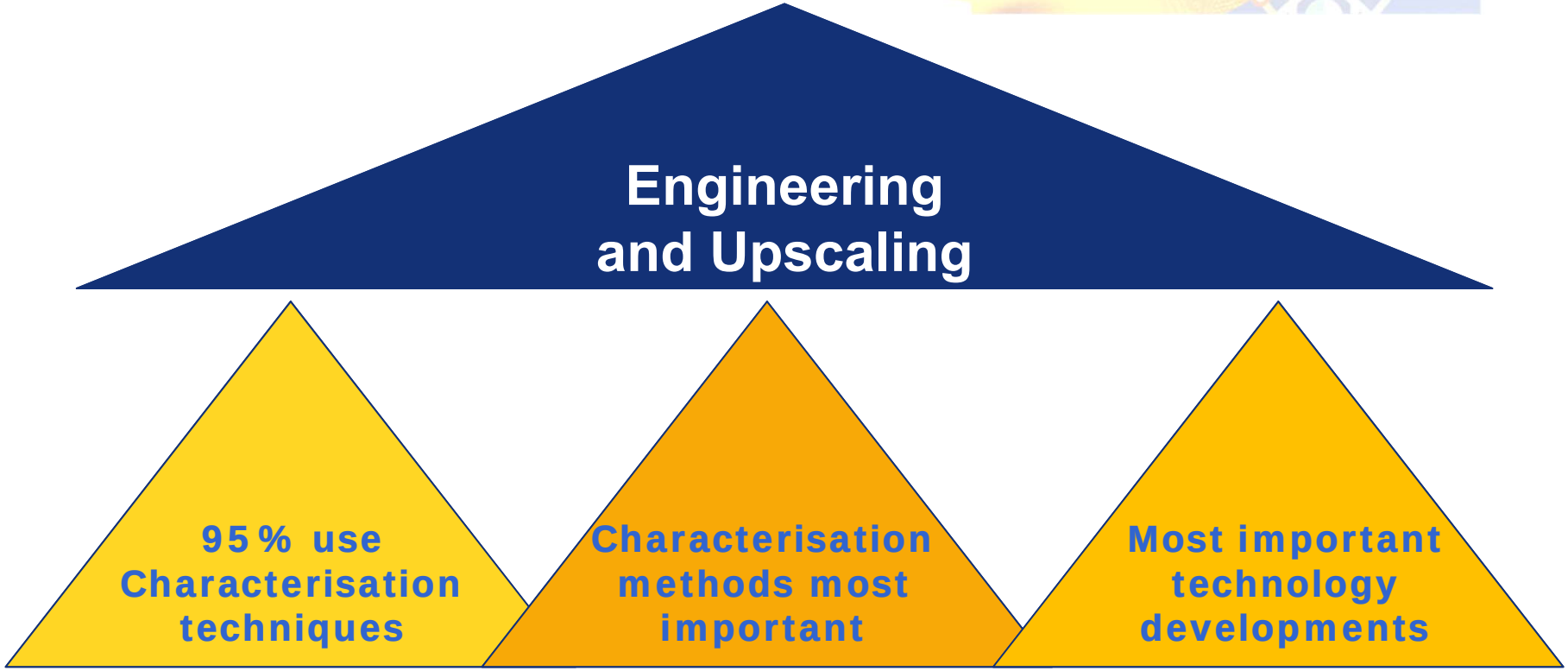
Materials Characterisation in EU-funded projects



1, EMCC Roadmap
2, Characterisation Task Force Report

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The European Materials Characterisation Council

- ✓ **Set up at the beginning of 2016**
- ✓ ***A bottom-up activity*** **based on the involvement and support of a wide range of stakeholders.**
- ✓ **Coordination between European, national, regional initiatives and Member State support and contribution will be essential to reach full impact of the EMCC.**

www.characterisation.eu

EMCC Roadmap for Materials Characterisation

The European Materials Characterisation Council (EMCC) proposes and elaborates strategic actions
materials that are necessary to spur and support industrial exploitation of
Europe. This roadmap describes the actions that are expected to address
et of stakeholders in the field of materials characterisation, and to have a
aterials modelling and manufacturing communities.

The aim of the EMCC is to support the process of *developing and improving* characterisation tools to bring the development of nanomaterials and advanced materials in Europe into end products more successfully.

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Open Innovation Environments

Launched to facilitate sharing of characterisation data and knowledge, working within the triangle of manufacturing, modelling and experimentation.

Nano-scale contact mechanics, development of nano-patterned, nano-engineered or chemically modified devices with controlled surface free energy and adhesive properties

OYSTER

Multiscale characterisation of Organic/Large Area Electronic (OE) materials, materials behaviour and nano-devices (OPVs, PPVs, OLEDs) manufacturing processes.

Development of Scanning Microwave Microscopy for 3D electrical characterisation of nanostructured semiconductors.

MMAMA

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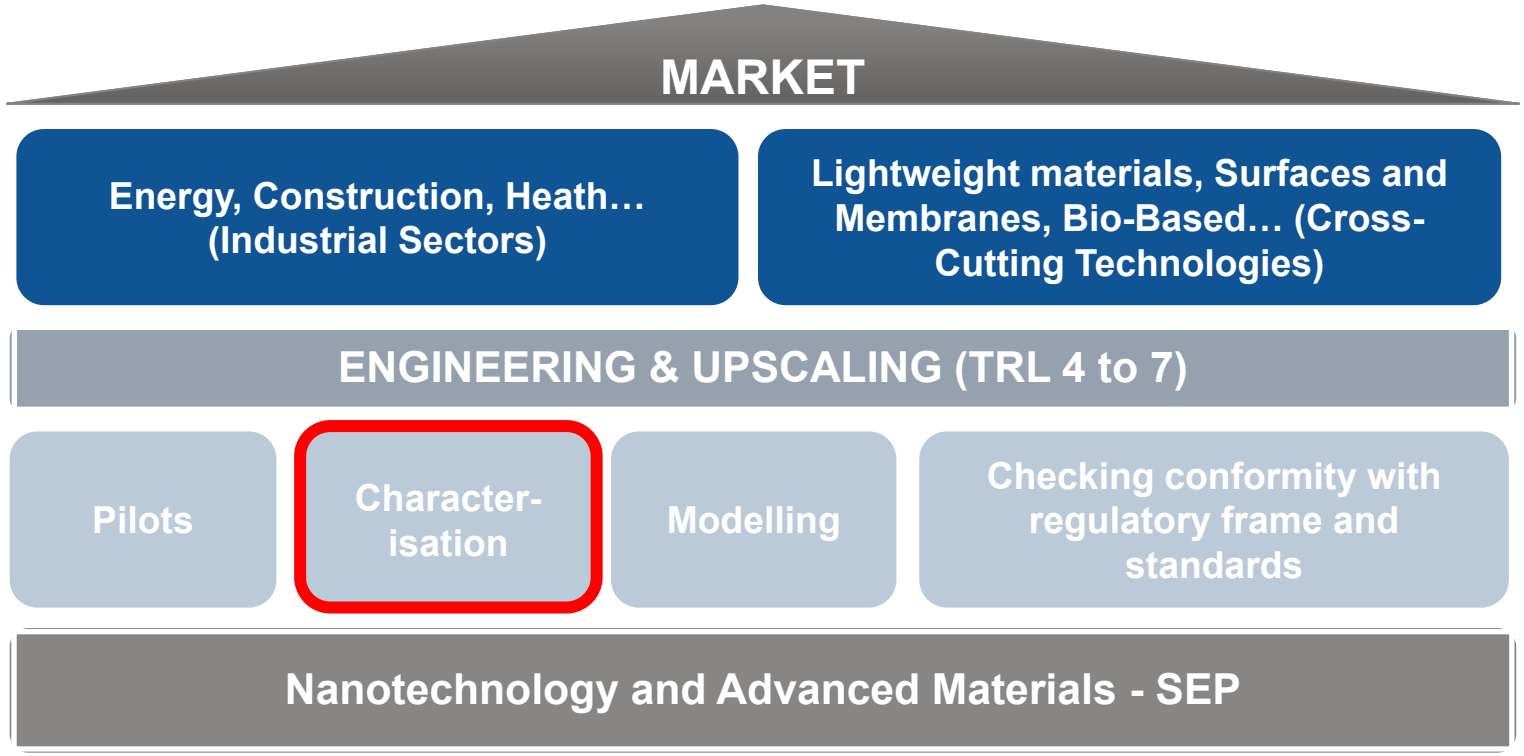
Open Innovation Test Beds

Challenge of accessing facilities for materials upscaling including characterisation being addressed by Open Innovation Test Beds.



Aim: bring nanotechnologies and advanced materials to within reach of companies and users by offering access to physical demonstration, upscaling facilities and regulatory services in order to reduce the risk of investment for investors of new technologies.

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Open Innovation Test Beds

OITBs advancing characterisation and testing techniques

TEESMAT

Access to facilities for novel characterisation and test solutions electrochemical energy storage materials

Test Bed enabling intelligent tribological materials characterisation to validate systems of friction and wear.

i-TRIBOMAT
Intelligent Open Test Bed for Materials Tribological Characterisation Services

FORM PLANET

Characterise sheet metal properties, predict part performance, reduce production loses in the sheet forming industries

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Evaluations In Progress…

Real-Time Nano-Characterisation Technologies

- Challenges due to **constant increase of requirements** in regard to **fast process and product quality control, regulatory compliance and quicker market introduction** of high quality products.

- Need to advance and establish **nano-scale, multimodal and multi-scale materials characterisation tools and methods, allowing rapid and reliable high-resolution analyses.**

- Optimisation of existing or the development of **new technologies, characterisation equipment, data processing routes and data analysis strategies.**

Roadmap: Advancement and valorisation of characterisation tools

PROJECTS WILL START IN 2020.

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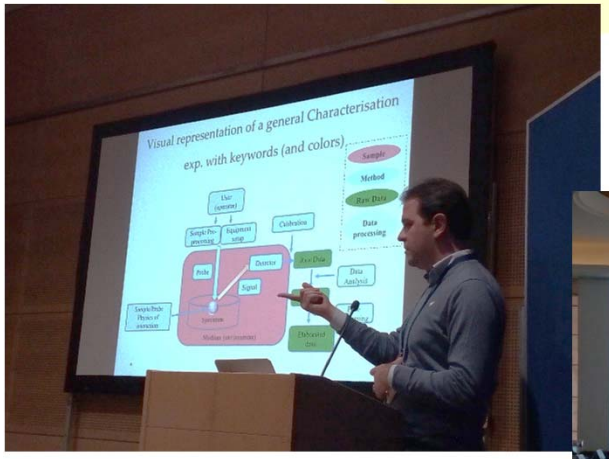
Collaborations between projects, EC, international community

Workshops in

-Brussels (June, 2018),

-Vienna, IndTech (Oct 2018),

-Seoul, Korea-EU NanoWorkshop (Nov 2018)



8th edition of KO-EU NanoWorkshop in Brussels, September 2019.

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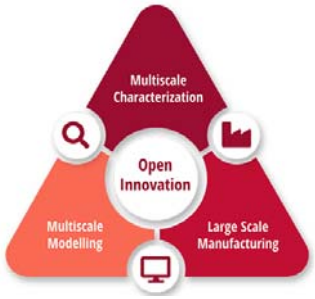
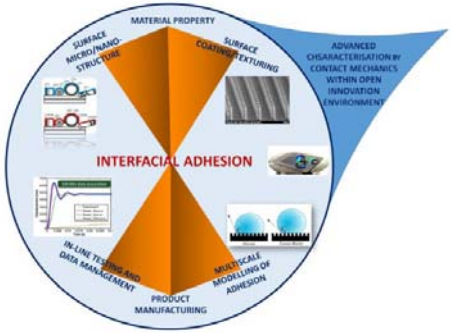
Project Collaborations…

Between CORNET, MMAMA, and OYSTER

- Approaches to cooperation in Open Innovation Environments under EMCC for greater impact.





- **NanoTexnology Workshop on OIEs**,

1 July 2019 Thessaloniki hosted by CORNET

2019 nanotexnology
International Conferences & Exhibition on Nanotechnologies, Organic Electronics & Nanomedicine

www.nanotexnology.com

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Project Collaborations…

CHAracterisation DAta – CHADA

Data from materials characterisation can be very different, depending on the adopted characterisation method;

Nonetheless, the availability of FAIR DATA on materials properties (behaviour) is probably one of the most precious need for industries and SMEs;

The real challenge here is to seek for a STANDARD DATA STRUCTURE for a range of experimental methods that can be very different;

The expected impact can be extremely wide, e.g. reduction of resources and time needed for product development, with clear associated environmental and societal benefits.

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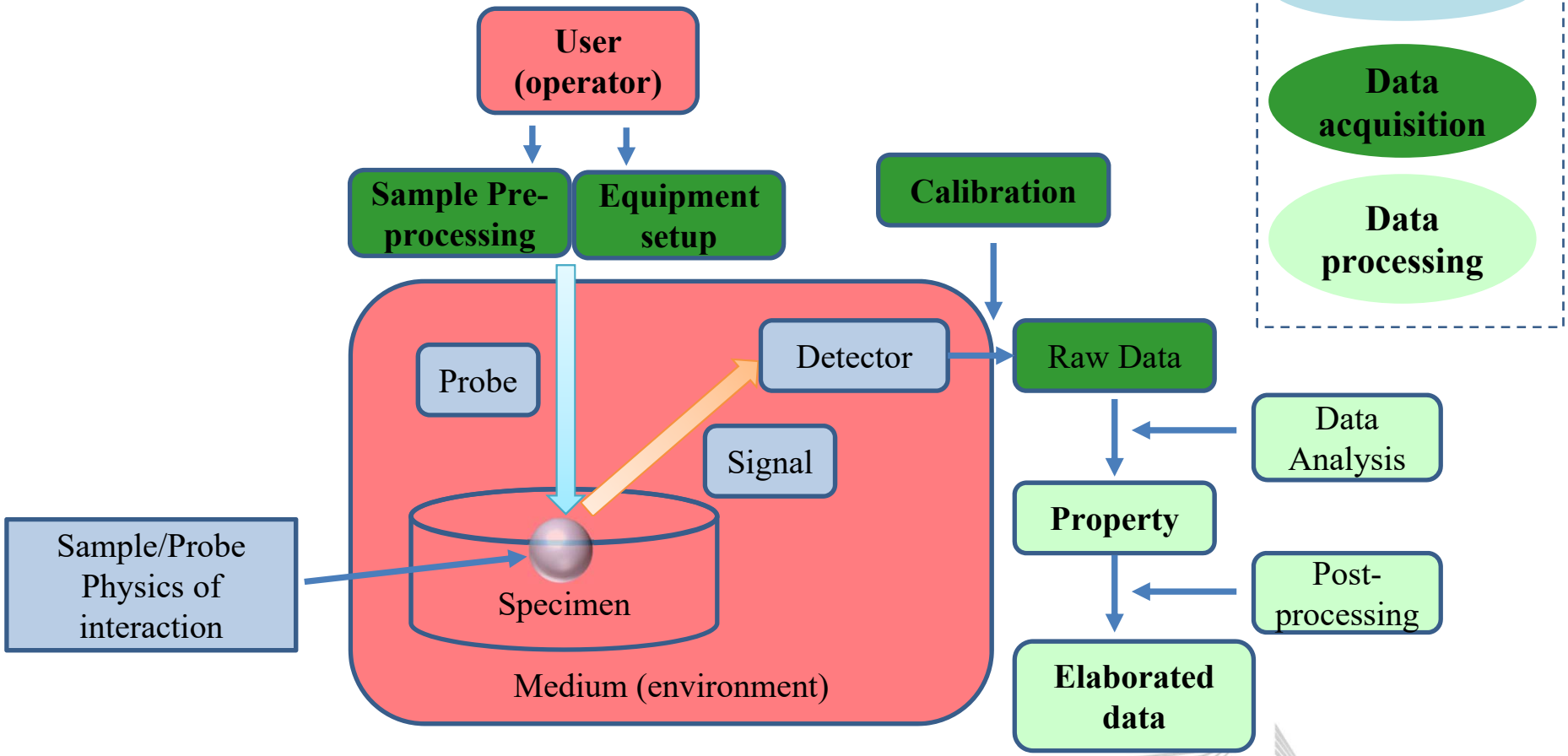
Visual representation of a general Characterisation exp. with keywords (and colors)



Keywords

Keyword	Description
User	Human Operator
Standard sample	Corundum, Silicon single crystal
Specimen requirements	Samples can include thin films on wafers or dense pieces up to 6" in diameter (maximum thickness of 3 mm), powders in top-loaded sample holders or in capillaries, dense pieces up to 60mm x 50mm x 15mm (and maybe even larger).
Medium (environment)	Mostly in air, but it can be done in different atmospheres and at different temperatures.
Specimen	Metals, Polymers, composites, ceramics etc. Samples can be powder, sintered pellets, coatings on substrates.
Sample/Probe Physics of interaction	Detection of the surface by the interaction of x-rays with sample (Diffraction) – Depending upon the diffraction geometries (Bragg Brentano or Grazing incidence) and input parameters (incidence angle, scan mode, scan type and increment ratio etc.). **Primary optics** (Goebel Mirror for parallel x-ray beam and Paraphocal block for divergent or nonparallel beam), **secondary optics** (Equatorial slits) and other slits are used to filter the x-ray radiations.
Equipment setup	Z- scan and rocking curve method is performed to adjust the height of the sample.
Calibration	Standard XRD samples with known diffraction pattern.
Probe	The characteristic x-rays are generated by using cooper (Cu) anode.
Detector	LYNEX XE is a high-resolution energy-dispersive detector for 0D, 1D and 2D diffraction.
Signal	Signals are generated by diffraction which occurs due to constructive interference if it follows the bragg's law ($n\lambda = 2dhkl \sin\theta$).

Keywords

Keyword	Description
Raw Data	Obtained diffraction pattern provides the information of peak position, peak intensity, peak broadening of certain hkl planes.
Data Analysis	Scanning of the sample surface (selection of scan type, scan mode and speed)
Post-processing	Powder diffraction data consists of a record of photon intensity versus detector angle 2θ. The acquired pattern is then compared with the material database in order to identify the hkl planes and phases corresponding to the diffraction peaks.
Property	Phase composition, crystal structure, epitaxy/texture/orientation, crystallite size and residual stresses can be measured by XRD.

CHADA – Your Input

Project Name	EU Topic ref.	website	Email of coordinator

List of main characterisation methods used in the project	Level of use in the project (basic user, advanced user, method developer, instrumentation developer)	Main reference in the project	Contact email(s)

Seba@uniroma3.it

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Future calls

Work programme 2020 Draft now available online

Industry Commons

-**Standardise the documentation** of data through taxonomies and ontologies

-Making data **accessible and enabling its re-use** across different domains

-Enable domains to **connect, link and exchange** information

-Create **a common information system** that would allow data sharing and enable new or improved materials, products, processes and services

-**Make the data FAIR**

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Future Calls

Towards harmonised characterisation protocols in NMBP

- Establishing standardised protocols especially important for new techniques to advance them out of the laboratory.
- Harmonisation requires input from many stakeholders and validation in different labs/facilities
- Lead to better comparability, traceability, reproducibility of data, quality certification, reduced time to market.

Official call text soon available:
https://ec.europa.eu/programmes/horizon2020/en/nmbp-work-programme-2018-2020-preparation

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Characterisation in Horizon Europe

Pillar 2: Global Challenges for Industrial Competitiveness

Cluster 4: Digital, Industry and Space

Materials Characterisation as an assurer of quality and for enabling materials development (along with upscaling, piloting and modelling

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Characterisation in Horizon Europe

However, as part of focus on co-creation, consultation will open for your feedback on what has been proposed.

https://ec.europa.eu/info/designing-next-research-and-innovation-framework-programme/what-shapes-next-framework-programme_en#latest

Also can apply to be a member of the mission boards. (deadline extended)

https://ec.europa.eu/info/news/commission-invites-top-experts-shape-new-research-and-innovation-missions-2019-may-13_en

https://ec.europa.eu/info/research-and-innovation/events/upcoming-events/european-research-and-innovation-days/registration_en

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