European Materials Characterisation Council

Overview

Task Force "Characterisation" Meeting; Brussels, 18th May 2016

Research and Innovation

The Background

- *a European initiative set up at the beginning of 2016, based on and strengthening the existing European Materials Characterisation Cluster (created at the end of 2014).*

- *Characterisation Tools cluster during 2014/15*
  - Incl survey and meetings in Brussels, Limerick and Riga

- *Characterisation needs identified in a 2014 survey of the Engineering & Upscaling cluster.*

- *Report on the two items above: "Characterisation: a central pillar for Engineering and Upscaling"*

EMMC – General information

• The aim of the EMCC, with the support of the Member States and Regions, 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.

• Coordination between European, national, regional initiatives and Member State support and contribution will be essential to reach full impact of the EMCC.

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EMCC - Objectives

- *To support establishing a community of European stakeholders in the process of developing and improving characterisation tools in order to bring the development of nanomaterials and advanced materials in Europe into end products more successfully.*

- *To gather the needs and requirements of that community for characterisation tools and supporting actions.*

- *To provide a forum for discussion, problem solving and planning R&I activities in Europe.*

EMCC - Objectives

- To establish the formation of standard methodologies.

- To create a platform for nanocharacterisation, with the attempt to act with Open Research Data.

- To link nanometrology with in-situ monitoring and industrial needs.

- To provide a suitable background for regulation and nanosafety.

- To support EC policy development, underpinning the relevant EC priorities, with a stakeholder driven roadmap for characterisation techniques for engineering and upscaling of nano-materials and advanced materials in Europe.

EMCC – status and activities

- *Set up at the beginning of 2016 (kick-off meeting March 11, 2016).*

- ***Meeting of the Task Force „Characterisation"*** *(26 experts nominated by HLG) planned for May 18, 2016 (EMCC representatives: G. Goldbeck, E. Zschech)*

- ***EMCC General Assembly and Workshop*** *planned at the European Conference Industrial Technologies in the RAI Amsterdam on June 24, 2016 (detailed information will follow).*

- ***EMCC Survey of development needs for characterisation***

- ***„Charter of the European Materials Characterisation Cluster / Council (EMCC)"*** *(Authors: G. Goldbeck, B. Boskovic, C. Caritidis, S. Fantechi)*

- ***Website*** *establisted:* www.characterisation.eu

- ***1st Newsletter*** *in preparation*

- The EMCC seeks close interactions with other Clusters/Councils, in particular the European Materials Modelling Council (EMMC), EPPN, NSC and the Engineering &Upscaling Cluster, the EuMaT – European Technology Platform for Advanced Engineering Materials and Technologies, the Research Data Alliance (RDA) and the Nanofutures initiative. There is a strong link to the Alliance for Materials (A4M) as well as to the large European Materials Research Society (EMRS) and the Federation of European Materials Societies (FEMS).

Working Groups

WG 1. Instrumentation and Metrology (Tofail Syed, Bojan Boskovic)

WG 2. Reference Materials and Measurements for Standardisation (Marco Sebastiani, Caterina Minelli)

WG 3. Characterisation Data and Information Management (Chris Eberl, Gerhard Goldbeck)

WG 4. Regulation, toxicology and safety (Hans Marvin, Steve Hankin)

WG 5. SMEs & Industrial Needs (Alan Taylor, Kiran Nagavalli)

WG 6. Policy (Gerhard Goldbeck, Bojan Boskovic)

WG 7. Networking Activities (Ehrenfried Zschech, Costas Charitidis)

WG 8. Dissemination (Elias Koumoulos, Bojan Boskovic)

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WG1: Instrumentation and Metrology

- *The scope of this working group is to develop and establish principles of measurement and their realization, measurement processes, procedures, methods and instruments in areas of metrology.*

- *Interaction with Sensors Cluster.*

- *Survey current metrological tools and theories available in the grand challenge areas and identify limitations.*

WG2: Reference Materials and Measurements for Standardisation

- Support widely agreed characterisation protocols.

- Establish links with standardisation/metrological bodies

- Collaborate with JRC on reference materials.

- Draft proposal with identification of characterisation methods that require:
  - **Standard vocabulary**
  - **Metadata description**
  - **Connection between metadata and performance descriptors**

WG2

- **Development of novel standards for:**
  - Description of materials
  - Description of characterisation techniques
  - Description and architecture of MetaData associated to materials characterisation

- *Sub-topics*
  - Search for a standard vocabulary on materials characterisation
  - Definition of a standard architecture for MetaData associated to materials characterisation
  - Connection between characterisation metadata and performance descriptors
  - Interaction with standardisation bodies and funding agencies
  - Promoting connection between large characterisation facilities and industry (including SME)

WG3: Characterisation Data, Information Management

- Actions in lines with 3Os: Open Science, Open Innovation, Open to the World.

- Support characterisation information management by elaborating metadata standards.

- Smart use of data: move from data collection to accessible, usable and understandable data/ quality of data

- Data repositories and comprehensive data capture/storage, addressing access to existing data.

- Support the need for an information system for materials laboratories, equipment and its availability

- "Databases for simulation" and "data for model validation" with strong interaction with the EMMC and future Materials Modelling CSA.

WG3

- *Materials description needs to be implemented – crossing time, size scales through the transient states of materials*

- *Data structure and management needs to be FAIR (Chuck Ward, MGI): Findable, Accessible, Interoperable, Reliable!*

WG 4: Regulation, toxicology, safety

A central component of nanosafety over the last 5-10 years has been the issue of nanoparticle dose-metrics and characterisation of nanomaterials

Common ground for a direct link between EMCC and NanoSafety Cluster.

EMMC and NSC

- NSC link could be used to begin to extract and consolidate all the NMs tested in the different media compositions and to try to draw out some commonalities and some areas of divergence that could then be the basis for some joint activities to understand the source of this divergence.

- EMCC could build on Round robin and validation activities undertaken within NSC projects, ensuring hand-over of experience, information, lessons learned and to prevent the same mistakes being made over and over again.

Toxicology Methods

- *Need methods that count and size nanoparticles. The EU definition of a Nanomaterial, indeed, is based on number distribution. Polydisperse suspensions are still challenging. No single, universal method has emerged. Rather, a hierarchical combination of methods (tiered approach: screening + confirmatory methods) might count and size nanoparticles accurately. Each type of material, however, would require its own combination of methods.*

Toxicology Methods

- *Need of methods for quantifying nanoparticles in complex matrices (Food, Feed, Soils, Cosmetics, Human and Animal tissues). More than identify and develop methods, the challenge here is how to extract/isolate/single out nanoparticles without altering them (e.g., through aggregation, or dissolution). Most, if not all, of the well known techniques used for characterising isolated Nanoparticles cannot be used directly on complex matrices: the real issue is to develop Standard Procedures for sample preparation. Each product, however, requires its own procedures.*

Toxicology

- *Need methods that can characterise the stability of materials in complex matrices*
  - **determining rates of dissolution, or aggregation, in intestine, lung lining fluid, plasma, human and animal tissues.**
- *The big challenge is the isolation of the materials from the matrix.*
- *The analytical challenge is about sample preparation.*

Prediction of toxicity (EMMC)

- *Numbers and volumes of current production of chemicals hinder a thorough investigation of their effects on human and environmental health.*

- *Simulations linking physical-chemical properties to known toxicities could give information about the "expected" toxicity of materials of new formulation.*

Study of toxicity in-vitro

- *Need tools for rapid and simple study of toxicity.*

- *Emerging use of artificial systems that mimic organs for screening, for biological (mechanistic) studies related to adverse outcome pathways (AOP).*

- *Attention growing around artificial tissues (3-dimensional cells cultures) and organ-on-chip models.*

- *Before these approaches can be used for regulatory purposes, they should be **standardised and harmonised**; consensus has just started to be generated about their results.*

WG 5 SMEs & Industrial Needs

- *Establish a network of industrial stakeholders*
  - By sector
  - Vertical segmentation – supply chain/pilot/evaluation
  - KTNs
  - H2020 Clusters
  - CEN/ISO standards committees
  - Regulators
  - Chambers of commerce
  - Investment community

- *Support entrepreneurship: implementing high risk and high potential new ideas*
  - Establishment of key route maps
  - Identification of drivers (trilema)
  - Identification of key discovery to deployment challenges
  - Translation of characterisation data into multi-variate performance descriptors
  - LCCA best practice
  - Directory of materials, capabilities, formulators/integrators
- *Improve access to large characterisation facilities*
  - List of facilities and capabilities by category

WG6: Policy

- *To support EC policy development, underpinning the relevant EC priorities, with a stakeholder driven roadmap for characterisation techniques for engineering and upscaling of nanomaterials and advanced materials in Europe.*

- *This activity is to support the strengthening of Europe's industrial capacity and competitiveness and thus contributes to the main objectives of the LEIT-NMBP programme.*

WG7: Networking

- *Act as a hub for information exchange between stakeholder groups active in the characterisation field, in particular instrument manufacturers, users, scientists, standardisation bodies and national metrology/standards labs (e.g. NPL, CEN/CENELEC, ISO committees).*

WG8 Dissemination

- *Develop distinct platforms of communication in order to facilitate the information flow between all the Working Groups, Project Partners of all EMCC Projects, as well as the wider community of characterisation interest groups and stakeholders, along the lines of the "Open Science", "Open Innovation" and "Open to the World" political priorities of the EC.*