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European Metrology Network (EMN) for Advanced Manufacturing

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European Metrology Network (EMN) for Advanced Manufacturing



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INTRODUCTION

The European Metrology Network (EMN) for Advanced Manufacturing has been established in June 2021. Currently 11 EMNs focussing on different important topics of strategic importance for Europe exist and form an integral part of EURAMET, the European Association of National Metrology Institutes (NMI). EMNs are tasked to

- develop a high-level coordination of the metrology community in Europe in a close dialogue with the respective stakeholders (SH)
- develop a Strategic Research Agenda (SRA) within their thematic areas
- provide contributions to the European Partnership on Metrology research programme Based on the analysis of existing metrology infrastructures and capabilities of NMIs, the metrology research needs for advanced manufacturing are identified in close cooperation with academic, governmental and industrial stakeholders. Here, we report on advanced

WHO WE ARE

EMN members

18 European NMI & Designated Institutes (DI) (Figure 1)

Partner Organisations

- European Technology Platform ManuFuture [1] 🚜
- EFFRA Made in Europe Partnership [2]
- NanoFabNet [3]
- euspen [4]

Options for formal relationship between

- VAMAS [5]
- AMi2030 [6]

Stakeholder Council

- Currently 12 members from industry
- Representing EMN key industry sectors (Figure 2)

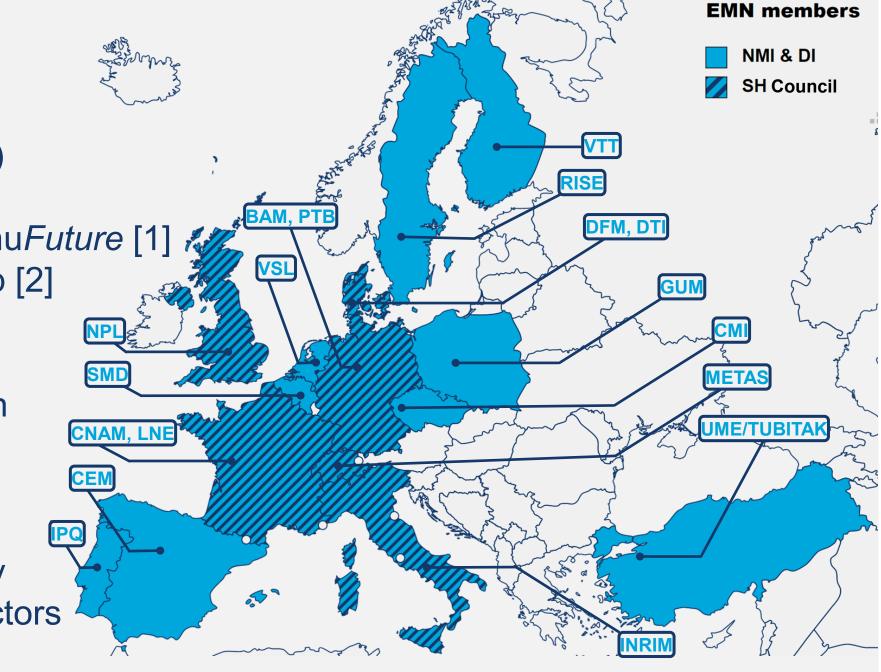


Figure 1: Map of EMN members.

STRATEGIC RESEARCH AGENDA

The EMN for Advanced Manufacturing is developing a SRA to identify priorities for research by Europe's NMIs and DIs and collaboration partners. Download: https://www.euramet.org/european-metrology-networks/advanced-manufacturing/strategicresearch-agenda. The content of this preliminary versions may change due to ongoing consideration of stakeholder feedback. Updates are planned in summer on a yearly basis.

materials metrology needs addressed in the EMN's preliminary SRA.

Cross-cutting topics:

- Working definition of Advanced Materials
- Harmonisation for increased comparability Reference materials
- Implementation of regulations, regulatory preparedness and safety aspects

WHAT WE DO

- Goal: Consideration of metrology aspects for the entire manufacturing chain (Figure 3)
- Cyclic approach for activities (Figure 4)

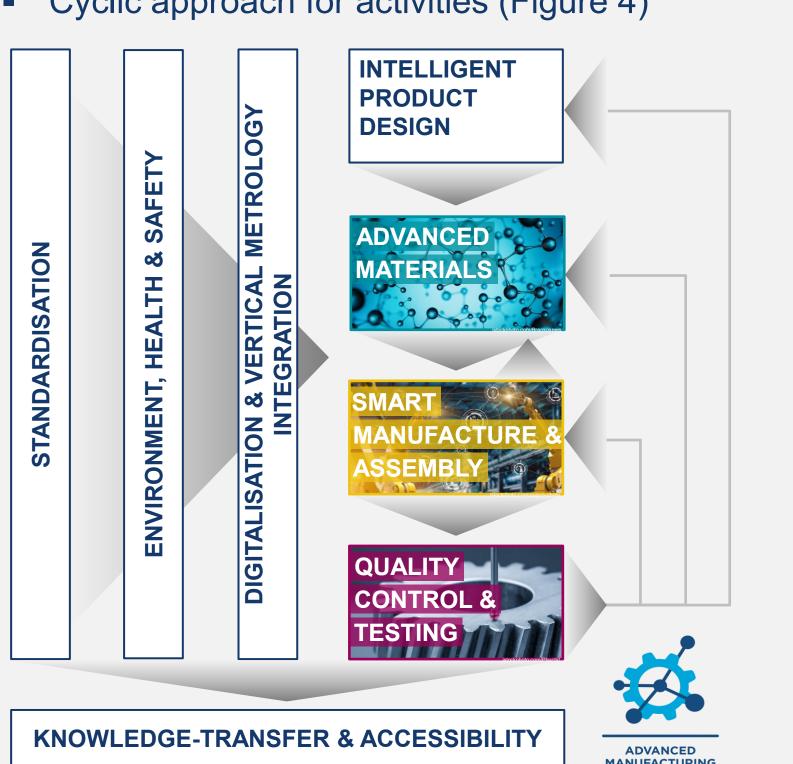


Figure 3: Cross-cutting topics of the manufacturing chain. EMN for Climate and Ocean Observation.

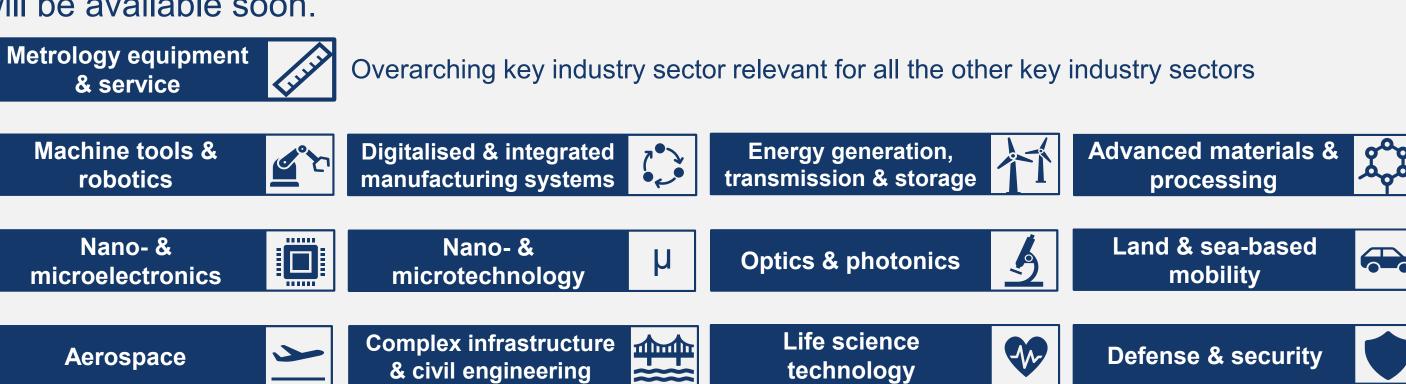
ADVANCED MANUFACTURING DEFINE SH engagement, needs & drivers identify and define SH needs respond to needs with SRA and roadmap

with high impact on European industry Figure 4: EMN activities general approach by

collaborative research projects on metrology topics

KEY INDUSTRY SECTORS

Ongoing stakeholder dialogue in all key industry sectors via frequently held workshops and open consultation events on special topics. An online service desk is in preparation and will be available soon.



Metrology for:

Figure 2: KIS of the EMN.

METROLOGY NEEDS IN ADVANCED MATERIALS

Advanced Materials addresses metrology and characterisation methods that are required to fully exploit the innovation potential of advanced materials, while ensuring safety and environmental compatibility. This encompasses the whole life cycle of manufactured products.

NEEDS ALONG THE ADVANDED MATERIALS LIFE CYCLE: EXAMPLE OF ADDITIVE MANUFACTURING

ITY ASSURANCE I Scalable metrology methods compatible with wide range of material specification

Figure 7: Scanning electron microscope image of m4p™ Superfine Metal Powders. Source: metals4printing

Advanced data analysis methods for hybrid metrology approaches High quality datasets

to validate virtual testing and materials informatic approaches

Measuring powder material distribution ...

AM PRODUCT DESIGN

Materials in complex environments

Process analytical techniques

Multi-techniques characterisation methods



- Digital Product Pass
- Design tools using scaled mat. properties & uncertainties
- Design for circular economy ...

RECYCLING

HARMONISATION



Figure 5: Reference material

Particles consist of iron oxide

and have an edge length of

~8 nm.

Source: BAM

Quality/contamination control of pre-used Additive Manufacturing powder

Working Definition of

Development of relevant

Advanced Materials

reference materials

regulations addressing

Implementation of

safety aspects ...

Digital Product Pass of **Advanced Materials** with metrology information ...

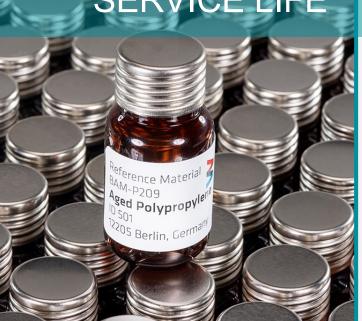


Figure 6: Electrode Induction

Melting Inert Gas Atomization

Systems for the production of

spherical metal powders.

Source: ADL

POWDER PRODUCTION

Figure 10: Aged reference materials Source: BAM



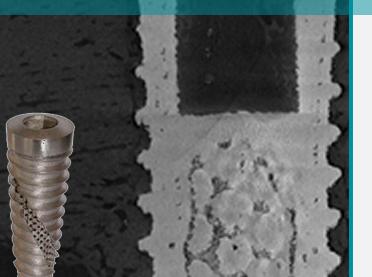
Methods for material property determination in complex environments (e.g. real word, harsh, rapidly changing conditions) ...

Determination of link

parameters & product

between process

quality ...



QUALITY ASSURANCE II

Figure 9: X-ray computed tomography images of a dental implant [7].

Characterization of interior material structures down to nanoscale

Multi-scale, multitechnique and high performance/high throughput characterisation ...



melting process. Source: DMG MORI

EMN ACTIVITIES WITH RESPECT TO THE EUROPEAN PARTNERSHIP ON METROLOGY PROGRAMME

EURAMET call process EMN steering activity EMN main targets **Timeline**

Orientation pages requested | Call for PRTs* (opens in Jan.) Review of JRPs*** (Nov.) Runtime of approved Joint Research Projects (JRPs usually start in June in year after call) Call for SRTs** (Jun.) Writing of orientation pages | Planning of PRTs Collaborative projects on industry driven topics Coordination of SRTs • investigation of SH needs • draft SRA • EMN Website •final SRA sustainable EMN operation 2023 2024 2021 2022 2025 2027 2026

Figure 11: Timeline of EMN activities and European Partnership on Metrology programme. *Potential Research Topic **Selected Research Topic *** Joint Research Projects

CONTACT & NEWSLETTER SUBSCRIPTION

Get in touch via email advancemanu@euramet.org and visit our website www.euramet.org/advanced-manufacturing or subscribe to our newsletter by using the QR code on the right.





[1] http://www.manufuture.org/

[2] https://www.effra.eu/made-in-europe-state-play [3] https://nanofabnet.net/ [4] www.euspen.eu

[5] http://www.vamas.org/ [6] https://www.ami2030.eu/ [7] Obaton A-F et al. In vivo XCT bone characterization of lattice structured implants fabricated by additive manufacturing. Heliyon. 2017

