

EMMC: Communities and governance of models and digital representations of materials

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1. Introduction

EMMC (European Materials Modelling Council) [1] supports all aspects of modelling and digital representations of materials. It brings together all stakeholders including modellers, data scientists, software owners, translators and manufacturers in Europe. EMMC supports wide collaboration and industrial uptake of a digital and model-based approach to the whole materials life cycle. Key activities of EMMC are in data- and physics-based multiscale modelling and in harmonisation and standardisation of terminologies and ontologies to support data management and AI.

2. Materials modelling communities

EMMC has arisen as a bottom-up community starting in 2014 to address the diversity and confusion about the wide range of materials models and to support their industrial uptake. To date, EMMC represents hundreds of individual members and tens of European organisations covering all types of models, including physics-based, empirical and ML/AI. The MODA CWA [2] represented a unified representation of all types of materials modelling for the first time.

3. EMMO: model of the material world

Based on the need for a human-centred, science-based, machine actionable representation of the material world (including all physical objects, materials, processes, models, data etc), the EMMC-CSA project initiated the development of the EMMO ontology, with further development in a large number of Horizon projects. EMMC ASBL provide the overarching governance required to support collaboration and ensure alignment of efforts. This is achieved via EMMC Task Groups in the Focus Area Digitalisation and Interoperability. EMMO is already widely used in the battery field [3] and provides the framework for documentation of characterisation [4]. It is ready for uptake across all types of materials applications and can provide a basis for FAIR data documentation required e.g. in materials passports. EMMO is a foundational ontology that is ready to support FAIR data in a Materials Commons (see Figure 1).

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4. Digital transformation of Materials Life Cycles.

A model-based approach is at the heart of a digital transformation of materials life cycles from design to re-use. It relies on a virtuous cycle of innovation as shown in Figure 2. For further details, see the EMMC Roadmap [5], elaborated in collaboration with AMI2030.

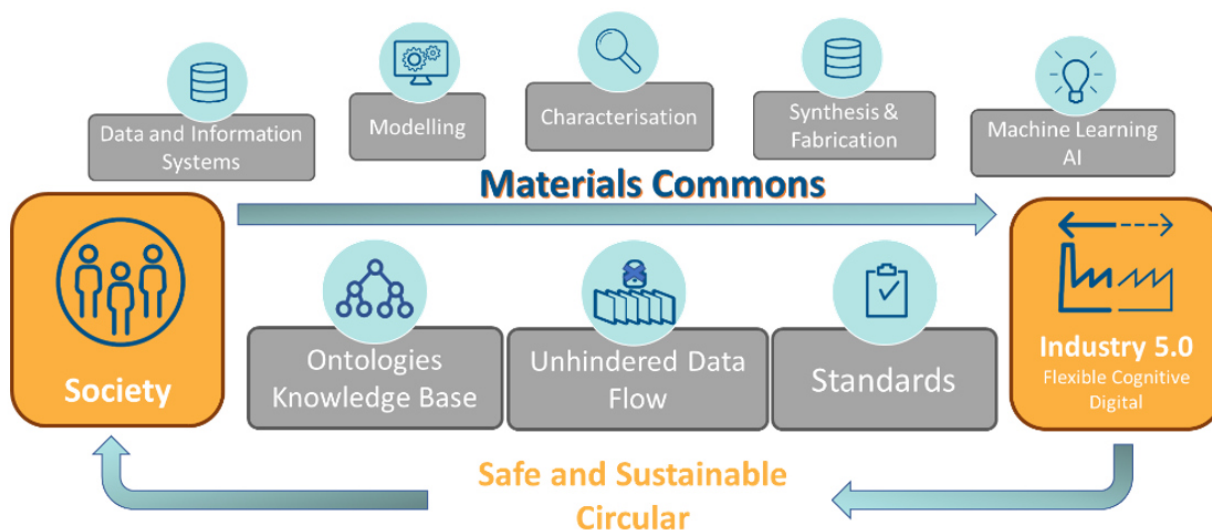


Figure 1: EMMC supports the creation of a Materials Commons in an Industry 5.0 context.

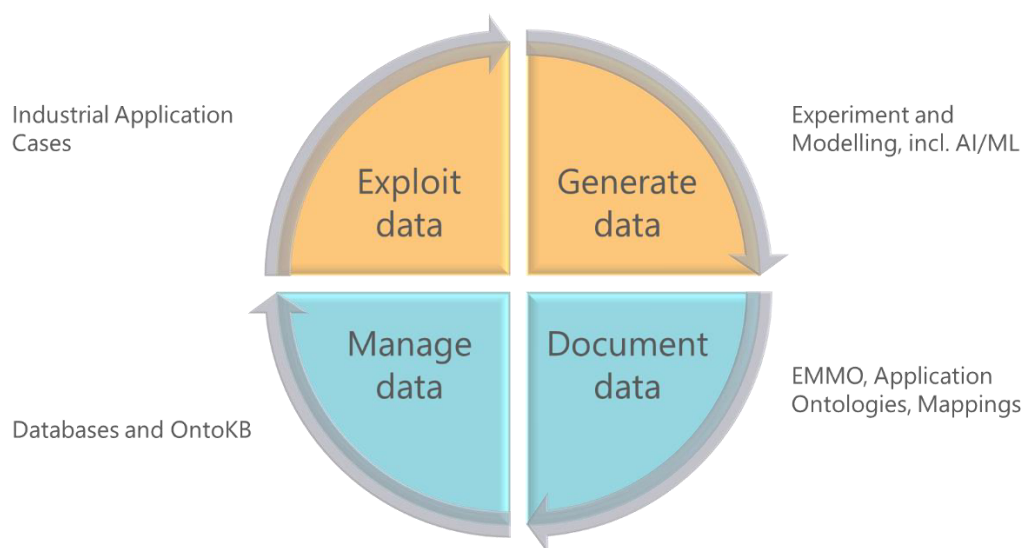


Figure 2: EMMC communities collaborate to support a virtuous cycle of innovation based strongly on models and digital representations of materials

5. Conclusions

EMMC and its stakeholders have been spearheading a harmonised, model-based approach to materials innovation for more than 10 years. The combination of advanced materials models and ontological models of the material world are instrumental to achieving a Materials Commons which is built on shared knowledge (rather than confidential data) and fosters cooperation and exchange.

6. References

- [1] European Materials Modelling Council: <https://emmc.eu/>
- [2] CEN Workshop Agreement CWA 17284. Materials modelling - Terminology, classification and Metadata https://www.cenelec.eu/media/CEN-CENELEC/CWAs/R/cwa17284_2018.pdf
- [3] <https://big-map.github.io/BattINFO/getstarted.html>
- [4] <https://github.com/emmo-repo/domain-characterisation-methodology>
- [5] EMMC Roadmap: <https://emmc.eu/emmc-roadmaps/>