

EMMO

European Materials & Modelling Ontology

A digital framework for materials science

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OntoTrans in simple terms

OntoTrans deals with **Information** relevant to particular User Cases (**Knowledge** Sources) and provides **Insights** (recommendations) through ontology-based graphs.







Innovation Case: Holistic view





A workflow of the innovation case identifying all the **entities** that play a **role**, meaning:

- there is some causality / interaction
- their properties/behaviour are of importance
- there are knowledge sources (data, measurement, model) for them



The Innovation Case may have different levels of detail, both in space and time.

Can be expressed by means of *direct parthoods*, the so-called reductionist perspective in EMMO

"Multiscale"



'Perspective' subclasses: several subjective ways to represent Physicals

Reductionistic Perspective: direct parthood

Material Entities **can** be represented in EMMO by a <u>Hierarchy of parthood relations</u>, Including the NEW concept of **direct parthood**

One material - different levels of granularity.

7

Hierarchy of structure can be univocally defined.



Mereotopology



Holistic Perspective

- Describes whole 4D object (process) and the role of its participants
- Can be understood as a 'semiotic process'

Charles S. Peirce semiotic theory



Three distinct elements:

- what is represented, i.e. the real world object
- the *sign* used for representation: entity in the ontology and related relations/axioms
- the *ontologist* that declares the sign stands for something else.





Measurement and Properties in EMMO

 Described by and connected via the Holistic Perspective and the interpretation by the ontologist (interpreter) who relates the value of a property to the participating material.





Property



Property is determined by a well defined process, participated by a well defined instrument and a specific material sample.



EMMO: Model

- A Model is a Sign
- Defined as a simplified representation of a physical or process, aimed to assist calculations for description or for predictions of its behaviour.





MSE Congress, Digital materials, ontology based data structures & interoperability, 22/09/20

Development and application of EMMO in EU Projects



European Materials Modelling Council, EMMC ASBL



Digital Ontology-based Modelling Environment for Simulation of materials

MarketPlace



Materials Modelling Marketplace for Increased Industrial Innovation

Virtual Materials Market Place

Ontology Driven Open Translation Environment



Ontology-driven data documentation for Industry Commons

2016

EMMO foundations laid within EU project EMMO governance managed by EMMC ASBL

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EMMO applications cases Team of philosophers, ICT experts and applied scientists.

EMMO applied to larger materials modelling communities and marketplaces infrastructures.

EMMO Domain ontologies and industrial application cases

Ontologies and tools foundation for data documentation in materials and manufacturing industry

MSE Congress, Dig

European Materials & Modelling Ontology (EMMO)

A digital framework for materials science

https://github.com/emmo-repo/

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Analytical Philosophy (mereotopology, semiotics, logic)



Physical Sciences (physics, chemistry, material science, engineering)



Information Technologies (reasoners, platforms, formats)

- Quantum to engineering systems
- Materials and fields (mass and massless)
- Material, Characterisation and Models
- Properties defined via measurement process: compliant with ISO 1303



Representation at different levels of granularity, depending on perspective.



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https://ontotrans.eu/



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https://emmo.tech

https://emmc.eu

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