NEWSLETTER

nanoMECommons

2022 – ISSUE 1

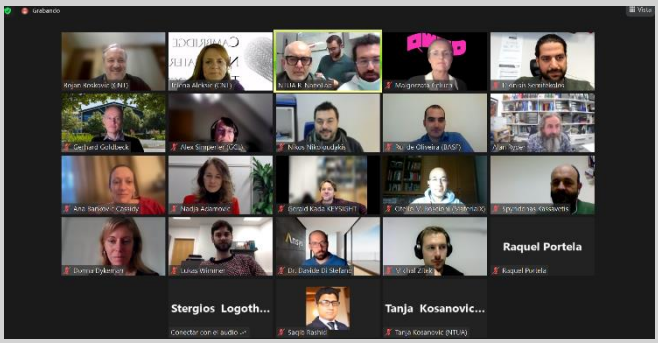
Project Overview

NanoMECommons will establish a transnational and multidisciplinary research and innovation network to tackle the problem of nanomechanical materials characterisation in multiple industries.
The focus of **NanoMECommons** is to employ innovative nano-scale mechanical testing procedures in real industrial environments, by developing harmonised and widely accepted characterisation methods, with reduced measurement discrepancy, and improved interoperability and traceability of data. To achieve this goal, **NanoMECommons** will offer protocols for multi-technique, multi-scale characterisations of mechanical properties in a range of industrially relevant sectors, together with novel tools for data sharing and wider applicability across NMBP domain: reference materials, specific ontologies and standardised data documentation.

Surface science and nanostructures, Nano-materials (production and properties), Characterization methods of materials, Nanotechnology, nano-materials, nano engineering

Workshop on Materials characterization – 13 December 2021

The 1st co-creation Workshop, entitled "Materials characterization challenges to support the industry transition in the digital era" has been successfully conducted, with the participation of more than 20 experts, 10 projects, 4 key industrial players, and over 50 attendees. This co-creation workshop event was supported by the European Materials Modelling Council (EMMC ASBL) and the European Materials Characterisation Council (EMCC). The objective of the workshop was to establish synergies within NMBP characterization projects and testbeds on emerging challenges that arise in the context of industrial twin transition to Industry 4.0 and 5.0, with special remarks paid on the following topics; a) Interoperability – Standardisation – Harmonisation, b) Thinking Digital – entry to a new era, c) Industrial Insights. A report on the summary of the presentations and discussions which took place has been drafted and made public through Zenodo with 48 downloads so far.



nanoMECommons M12 Meeting 18-19 Jan. 2022

Partners of the nanoMECommons project held their 12-month review meeting virtually, on the 18-19 January 2022.
They presented the first results of their work, the progress achieved on this first year, as well as the plans for the future plans.

Participation at the 1st International Symposium for Materials R&D Data

nanoMECommons was represented at the 1st International Symposium for Materials R&D Data, Satellite Sumposium of NanoKorea 2022, by Dr Gerhard Goldbeck from Goldbeck Consulting This event took place on the 8 July 2022. This symposium was Organized by National Center for Materials Research Data of Korea. The presentation was entitled: Materials Data Documentation: How to Improve Interoperability in a Complex Field of Perspectives and covered multiple projects, in particular OntoCommons, OntoTrans, NanoMEcommons.

nanoMECommons was present at the FLEPS 2022

Donna Dykeman from Ansys Granta (nanoMECommons partner), gave a presentation at the 4th IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS 2022) on the 11 July 2022. The conference was held as a hybrid event, in Vienna, Austria. The talk was entitled: Building an industry-driven "innovation ecosystem" through the establishment of digital platforms for characterization.

Publication in Applied Ontology journal on the CHAMEO ontology

Goldbeck Consulting Ltd has publish on the Applied Ontology journal , the publication: *CHAMEO: an Ontology for the Harmonisation of Materials Characterisation Methodologies.* The authors are: Daniele Toti, Pierluigi Del Nostro, Gerhard Goldbeck

https://content.iospress.com/articles/applied-ontology/ao220271 DOI: 10.3233/AO-220271

nanoMECommons M18 Review Meeting 19-20 June 2022 - Austria

The M18 Review meeting took place on the 19-20 June 2022, as a hybrid event, hosted in Leoben, Austria by the partner Montanuniversitaet Leoben.
Partners of the nanoMECommons project presented their work carried out during the first 18 months. as well as the plans for the future plans. The meeting was attended by the Project Officer and Project Monitor, who were happy with the progress the project has achieved so far.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CHAMEO: An ontology for the harmonisation of materials characterisation methodologies

Cite

Article type: Research Article

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Note: [] Accepted by: Emilio Sanfilippo

Abstract: The field of materials characterisation encompasses a wide range of methods and related research communities. This has led to a proliferation of terminologies and data management approaches, hindering collaboration and interoperability. In this work, a domain ontology designed to model the common aspects across the different characterisation methodologies is presented. This ontology, called the CHAMEO ontology, is based on a recent CEN Workshop Agreement (CWA 17815) which introduced a standardised terminology and the Characterisation Data (CHADA) documentation scheme. The goal of CHAMEO is to provide a framework for harmonising the underlying method-specific ontologies, which can be developed by reusing and specialising the generic constructs of the CHAMEO ontology. This work is part of a broader initiative under the umbrella of the European Materials Modelling Council (EMMC), for the development of interconnected materials modelling ontologies based on a common root that is the Elementary Multiperspective Material Ontology (EMMO). The CHAMEO ontology was developed within the NanoMECommons European project that has the goal of harmonising characterisation protocols. The CHAMEO ontology has also been aligned with a number of recently developed, EMMO-based domain ontologies for the classification of materials, models, manufacturing processes and software products related to Materials Modelling. Availability: The axiomatization of the ontology is stored in a GitHub repository available at: https://github.com/emme-repo/domain-characterisation-methodology and is published at the following URL: http://emmo.info/emmo/domain/chameo/chameo.

Keywords: Ontology, materials modelling, knowledge sharing, EMMO, materials characterisation, interoperability, materials

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Keynote presentation and conference paper at the MSE 2022, Darmstadt (Germany), 27-29 September.

Goldbeck Consulting Ltd will have a Keynote Lecture in Symposium M04 entitled: Modelling and characterisation as knowledge sources in a digital materials ecosystem: activities of EMMC, EMCC and related projects. They will also give a lecture in Symposium C07, titled: A domain ontology for materials characterization methodologies, Goldbeck, G. (Speaker); Del Nostro, P.; Toti, D. This event is taking place on the 27-29 September. In Darmstadt (Germany). https://dgm.de/mse/2022/

The NANOTEXNOLOGY 2022 – 2-9 July 2022

The nanoMECommons activities has been presented at the NANOTEXNOLOGY 2022 multi-event that has been organized by AUTh (as a hybrid event) in Thessaloniki, Greece at 2– 9 July 2022. NANOTEXNOLOGY is the largest technology, networking and matchmaking annual event in Europe that includes the premier and Internationally established events:

- International Conference on Nanosciences & Nanotechnologies (NN22) 5-8 July
- International Symposium on Flexible Organic Electronics (ISFOE22) 4-7 July
- International Conference on 3D Printing, 3D Bioprinting, Digital & Additive Manufacturing (I3D22) 6-7 July
- International Summer Schools "N&N, OE & Nanomedicine" (ISSON22) 2-9 July
- NANOTEXNOLOGY EXPO 2022, 4-8 July
- Business Forum, 5-7 July
- Matchmaking Event, 6 July

Participation at the FOM122 – 12-15 September 2022

NanoMECommons will be represented by the partner Goldbeck Consulting Ltd , who will present at 12th International Workshop on Formal Ontologies meet Industry (FOMI22), 12-15 Sept 2022, Tarbes (France): https://ontocommons.eu/news-events/events/12th-international-workshop-formal-ontologies-meet-industry-fomi22 The paper to be presented is titled: The CHAMEO ontology: exploiting EMMO's multiperspective versatility for capturing materials characterization procedures. Authors: Pierluigi Del Nostro, Gerhard Goldbeck and Daniele Toti.

Information about the nanMECommons project has been distributed to the NANOTEXNOLOGY participants as part of the activities of AUTh. The target was to inform the academic, research and industrial stakeholders that participated to the event, on the project activities as well as on the AUTh activities in the fabrication and characterization of innovative Organic Electronics nanomaterials and devices.

Within the NANOTEXNOLOGY 2022, a Special Workshop has been organized on Open Innovation and Standardization for materials characterization, materials modelling and materials process and manufacturing.
During this Special Workshop a series of Invited talks, Oral and Poster presentations were given by representatives from currently running EC R&D projects in that cover different aspects of Open Innovation for materials characterization & modeling (ranging from the atomic to the macro-scale or multiscale) applied on a broad range of subjects and applications. These invited speakers included AUTh, Goldberg Consulting, ANSYS, among others. For example, D. Dykeman by ANSYS presented an Invited Presentation with the title "Building an industry-driven "innovation ecosystem" through the establishment of platforms for characterization".

The Workshop topics included:

- Open Innovation for multiscale modeling of materials
- Open Innovation for multiscale characterization of materials
- Open and FAIR Data
- Ontologies and Interoperability
- Modeling Data Analysis (MODA)
- Characterization Data (CHADA)
- Process and Manufacturing
- Standardization needs in the manufacturing sector
- Industry needs on Open Innovation approaches
- Business Models and Sustainability for Open Innovation Databases

Finally, this Special Workshop facilitated several discussions and interactions among stakeholders that represented different EU funded R&D Projects working on Open Innovation, such as RealNano, MUSICODE, VIPCOAT, OpenModel, etc.

Photos from the Workshop on Open Innovation and Standardization during NANOTEXNOLOGY 2022. Top: Dr. Dario Campagna (ESTECO), Down: Dr. Donna Dykeman (ANSYS)

NTUA role in the Project

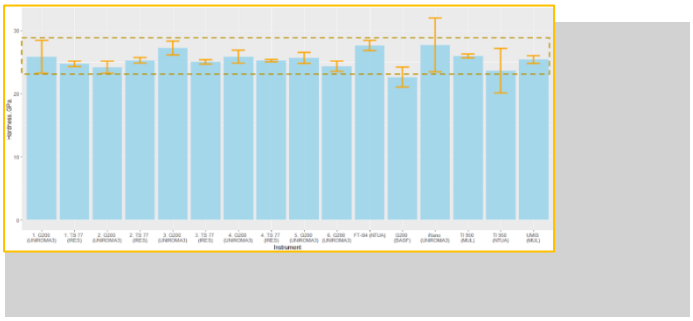
NTUA is responsible for the **coordination and management** of the project. NTUA performs high-resolution and **high speed nanomechanical testing**, through instrumented indentation, in the framework of WP2, as well as is developing **Machine Learning** and AI methods for improved data analytics and knowledge extraction by the testing method.

R-NANO Research Unit of Advanced, Composite, Nano-Materials & Nanotechnology

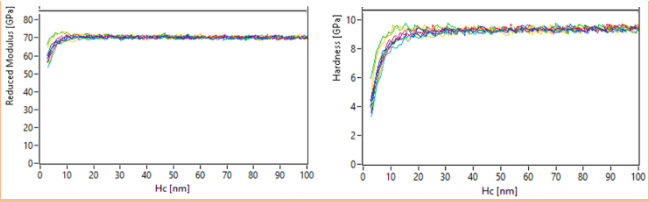
Nanoindentation achievements

In the framework of WP2 the nanoindentation protocols harmonization has been accomplished. This has been a collective effort between partners of MUL, UNIROMA3, NTUA, IRES, and BASF using 7 different nanoindenter instruments and over five different protocol types, with the results on the reference Si3N4 thin films developed by MUL demonstrating just 5% variation, which is almost equal to the variation when testing bulk fused silica samples (commercial standard for calibration).

Another achievement was the validation of Continuous Stiffness Measurement (CSM) and 4D nanoindentation protocols by standard nanoindentation. Those results are a great leap forward, in the direction of inter-laboratory and inter-instrumental harmonization of the indentation technique and will serve as the basis for further development of harmonized and ultra-fast protocols



Also, in the scope of **finer characterization** resolution, dependable reduced elastic modulus and hardness were obtained in Continuous Stiffness Measurement (**CSM**) mode with a high sensitivity protocol. The result was achieved in **very low depth**, with the properties values being constant from a contact depth of about 10 nm in the fused silica reference sample.



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