

EuMaT

European Technology Platform for Advanced Engineering Materials and Technology







EuMaT Aims:

The primary objective of EuMaT is to define the **Strategic Research Agenda** in the area of Advanced Materials and Technologies.

Further goals and activities of EuMaT:

- **Coordination** at **European level** the Materials R&D initiatives;
- **Dialogue** between industry, R&D actors and institutions;
- **Promotion** of interdisciplinary education and training;
- Fostering cross-sectorial contributions of Engineering Materials and Technologies to the grand societal challenges of today;
- Sustainable materials manufacturing and recycling.
- Impacts on public health, safety, environmental risks, and
 Circular Economy.

EuMaT is open to all interested new members accepting **EuMaT** goals, principles and statutes.



Primary Objective:

The **Strategic Research Agenda (SRA)** puts together the mid- and longterm research directions and needs for Advanced Engineering Materials and Technologies, providing guidance to materials research policies of the EU

Dowload at http://eumat.eu/



"Materials technology will play a major role for the European industry. It will influence the competitiveness of practically all industrial sectors."

European Technology Platform for Advanced Engineering Materials and Technologies



- Leading global position and competitiveness of the EU technology in the area of Advanced Engineering Materials and consolidate an unified European policy in this area.
- to ensure optimum involvement of Industry and other important Stakeholders in establishing European R&D priorities

Development of entirely new materials (nanomaterials, active/intelligent materials, composites, hybrid and multimaterial structures etc.) and **qualifying them for the market.**

Modification of **existing materials for new applications** (new grades of existing materials systems, new manufacturing processes).

Innovative use of existing materials based on good understanding of applications, material requirements and **materials degradation mechanisms**



Alliance of Materials (A4M), EUMAT

EUMAT is an original initiator of A4M.

A4M Goal: Integration of ETPs,

dealing with materials, all along the value chain.



EU Network Support: CSA projects: MatVal (FP7), and **MATCH** (H2020) already finished.



EuMaT Organizational Structure



EuMaT - horizontal Platform linked to DG Research and Innovation,
 Directorate D – Key Enabling Technologies,
 Unit D.3 – Advanced Materials and Nanotechnologies

EUMAT has set up 8 Working Groups (WG), established to cover specific fields of competences in the materials world, and to identify their challenges:

WG 1: Modelling and Multiscale

- WG 2: Materials for Energy
- WG 3: Nanomaterials and Nano-Assembled Materials
- WG 4: Knowledge-based Structural and Functional Materials
- WG 5: Life cycle, Impacts, Risks
- WG 6: Materials for Information & Communication Technologies
- WG 7: Biomaterials
- WG 8: Raw Materials

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EuMaT Working Group 1: Materials Modelling

Challenges:

To develop modern and highly efficient simulation techniques to design new materials, improve material properties, optimize and control manufacturing processes and to develop new cost and environmental efficient products. Need to develop experimental data bases, multiscale methods and algorithms for data mining



Ambition / Objectives / Mission:

To promote individual **modeling topics**, building commitment and momentum for future activities in the field of industrial technologies, reflecting the work of project clusters or networks (EMMC), cutting-edge technologies and products.

Contact: Dr. Amaya Igartua– amaya.igartua@tekniker.es

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EuMaT Working Group 2: Materials for Energy

Challenges:

Structural and functional materials for low carbon energy technologies, e.g. for dispatchable thermal power or non-dispatchable wind and solar, including materials for energy conservation, transmission and storage - to give improved performance and durability in service.



Ambition / Objectives / Mission:

To bring together expertise across the **wide range of materials and energy technologies**, from new concepts to **performance in aggressive environments**, and to provide strategic direction for the energy materials community.

Contact: Prof John Oakey – j.e.oakey@cranfield.ac.uk

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EuMaT Working Group 4: Nanomaterials and Nano-structured Materials for Multifunctional Applications

Challenges:

Advancing the understanding and dissemination of how nanoscaled materials can be assembled,

embedded to achieve novel production processes exhibiting innovative properties for health, urbanization, mobility, energy, environment and safety.



Ambition: Paving the way for the creation of a pan-European network of competences among all stakeholders dealing with nanomaterials and nano-structured materials.

Contact: lars.montelius@ inl.int

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EuMaT Working Group 4: Knowledge-based Structural and Functional Materials

Challenges:

Advancing in the development of technologies for **new structural and functional materials,** which will create innovative solutions for different key industrial sectors, such as automotive, aerospace, healthcare and sustainable energy.



Ambition: Contributing to establishing a synergy among all stakeholders dealing with advanced structural and functional materials at a European scale, leading to the creation of a pan-European network of competences in the field of knowledge-based structural and functional materials.

Contact: Arnaldo Moreno, arnaldo.moreno@itc.uji.es

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EuMaT Working Group 5: Life cycle, Impacts, Risks

Challenges:

- risks in/of innovation (e.g. risks of unexpected sideeffects)
- **risk of non-performance** or performance below expectations (e.g. risks of system or component failures)
- risk of adverse/unexpected effects and impacts (e.g. on public health and/or environment)
- risks over the life-cycle of products and technologies (e.g. unexpected problems in decommissioning or recycling phase)
- project risks, especially in innovation, R&D and new technologies oriented projects

Analysis of the contribution of the **life cycle stages** to the overall environmental load to prioritize improvements on products or processes.



Contact: Aleksandar Jovanovic jovanovic@risk-technologies.com

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EuMaT Working Group 6:

Materials for Information and Communication Technologies (ICT)

Challenges:

The WP6 is centered on materials and nanotechnologies **for ICT and autonomous devices**. The aim is to develop new functional materials for Health, Transportation, ICT, Energy, Environment and Security



Ambition:

By contributing to the best relation and **dialogue** between different partners (industry, academic institutions) the major technological limitations should be lifted.

Contact: cecile.autret@univ-tours.fr

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EuMaT Working Group 7: **Biomaterials**



To contribute to the definition

Challenges:

funding strategies for increasing the competitiveness of Europe in the field of Materials for Health

Ambition / Objectives / Mission:

To organize a network of European competencies in the field of Materials for Health able to drive synergy in the biomedical research and industrial systems

Contact: silvia.pascale@livanova.com and enrica.verne@polito.it

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EuMaT Working Group 8: Raw Materials for a Circular Economy

Challenges:

Moving from the traditional, linear 'make, use, dispose' economy **to a circular economy**, where

- the value of products and materials is maintained for as long as possible
- material & energy resources usage are minimized

• **Recycling or compositing** For economic, social and environmental benefits.

Ambition:

Leading forum on the key role of **advanced material technologies** in the **raw materials & circular economy** domain, for the **EU processing and manufacturing industries**, providing market and science solutions.

Contact: Jan Meneve, jan.meneve@vito.be

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"Advanced Materials are cross-sectorial ENABLERS for technology that can tackle the grand societal challenges of our time."

		EuMaT activities in active working groups							
		Materials modelling	Materials for energy	Nano materials	Structural Functional materials	Lifecycle impact and risk	Materials for ICT	Bio Materials	Raw Materials
HORIZON2020 - Societal challenges	Health, Demographic Change and Wellbeing								
	Food Security, Sustainable Agriculture, Forestry, Marine								
	Secure, Clean and Efficient Energy								
	Smart, Green and Integrated Transport								
	Climate Action, Environment, Resource Efficiency, Raw Materials								
	Secure societies – Protecting freedom and security of Europe								

WP	Creative	Transport	Energy	Health	Construction
Modelling & Characterization	x	XXX	XXX	X	Х
Materials for energy		ХХ	XXX		Х
Nanomaterials and Nano- assembled materials	ХХ	XX	XX	XXX	
Knowledge based structural and functional materials		XX	ХХ	XX	
Lifecycle impact and risks	x	x	XX	ХХХ	Х
Materials for ICT	Х	XXX	XXX	XX	Х
Materials for Information and Communication Technologies (ICT)	X	XX	x	ХХ	Х
Biomaterials and biobased materials?	Х	XX	x	XXX	Х
Raw Materials for a circular economy	Х	XXX	ХХХ		ХХ
In addition: Materials for additive manufacturing	X	ХХХ	XX	XX	Х

European Technology Platform for Advance KETS APPROACH

Materials Common House

• Cut across many sectors

Case example: the electric vehicle

Transdisciplinarity: Combining several KETs for advanced products → Case study: electric vehicle De-carbonisation of transport Microelectronics **Societal Electric vehicle** Challenge Energy Biotechnologies 991 EGP 78 Nanotechnologies Photonics Advanced Advanced Manufacturing materials Systems

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NATIONAL AND REGIONAL FUNDING PROGRAMMES DATABASE

The information about all the funding research programmes identified has been collected in a public data base accessible at the MATCH website:

http://www.match-a4m.eu/index.php/match-web-db



Number of Programms by materials





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National/Regional Materials Research Funding Schemes



60% National-Regional vs 40% EU Coordinated

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MATERIALS RESEARCH NATIONAL AND REGIONAL PUBLIC FUNDING (M€/YEAR) VS GDP (10³ M€/YEAR)



The annual Materials research national and regional public funding of most of the countries studied was found to be proportional to the national Gross Domestic Product (GDP) of the respective countries

SE 140 120 ΕI 100 • FI 80 60 AT PI BE 40 DK 20 NO 100 150 200 250 300 350 400 450 500 National GDP 103 M€/vear

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EUMAT RELATIVE WEIGHT OF MATERIALS RESEARCH

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EU* = EU-28 +CH+NOMaterials GERDo,Public National/Regional Funding ≈ 2,500 M€/yearPublic European Funding ≈ 1,000 M€/yearo,Public European Funding ≈ 3,500 M€/yearo,Total Public Funding ≈ 3,500 M€/yearo,Private Funding ≈ 7,500 M€/yearo,Total EU* Materials Research Funding ≈ 11,000 M€/year

	GDP (billion €)	% Total Research /GDP	Total Research Budget (M€/year)	Materials Research National and Regional Funding (M€/year)	Materials Research National and Regional Funding /GDP (%)	Materials / Total Research (%)
AT	337	2,99	10.082	60,42	0,0179	0,60
BE	409	2,46	10.071	40,74	0,0099	0,40
BG	44	0,80	353	1,62	0,0037	0,46
HR	44	0,79	347	0,50	0,0011	0,14
CY	17	0,47	82	0,73	0,0042	0,89
CZ	164	2,00	3.278	20,24	0,0123	0,62
DK	266	3,08	8.199	39,60	0,0149	0,48
EE	20	1,44	295	1,20	0,0059	0,41
FI	207	3,17	6.568	94,30	0,0455	1,44
FR	2181	2,26	49.291	330,27	0,0151	0,67
DE	3026	2,87	86.846	570,19	0,0188	0,66
EL	176	0,84	1.478	1,63	0,0009	0,11
HU	109	1,37	1.489	9,83	0,0090	0,66
El	215	1,52	3.262	97,89	0,0456	3,00
IT	1636	1,29	21.110	106,30	0,0065	0,50
LV	24	0,69	168	1,50	0,0061	0,89
LT	37	1,01	375	3,10	0,0084	0,83
LU	52	1,26	657	8,37	0,0161	1,27
MT	9	0,85	75	0,20	0,0023	0,27
NL	679	1,97	13.368	39,95	0,0059	0,30
NO	344	1,71	5.882	13,83	0,0040	0,24
PL	428	0,94	4.020	53,85	0,0126	1,34
PT	179	1,29	2.314	24,65	0,0137	1,07
RO	160	0,38	610	20,37	0,0127	3,34
SK	78	0,89	695	3,98	0,0051	0,57
SI	39	2,39	920	2,72	0,0071	0,30
ES	1081	1,23	13.299	148,33	0,0137	1,12
SE	445	3,16	14.049	144,92	0,0326	1,03
CH	597	2,97	17.731	161,62	0,0271	0,91
UK	2569	1,70	43.671	544,34	0,0212	1,25
EU*	15.573	2,06	320.586	2.547	0,0164	0,79



Materials Research National and Regional Public Funding / National GERD (%)



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GROSS DOMESTIC EXPENDITURE ON R&D (GERD)



(*) Provisional. Source: Eurostat (online data code: rd_e_gerdtot)

European GERD as % of GDP (R&D Intensity) From 1,75 to 2,06% in 10 years

EU* = EU-28 +CH+NO GDP = 15,570 10³ M€ GERD = 320 10³ M€ R&D Intensity = 2.06%



Note: estimates. Source: Eurostat (online data code: rd_e_fundgerd)

> R&D Intensity by public/private sectors 32% Governmental founds



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R&D as a percentage of Gross Domestic Product

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China

COMPARING WITH THIRD COUNTRIES





Country	GDP (M€)	R&D Intensity (%)	GERD (M€)	Materials GERD (M€)	Materials R&D (%)
EU-28 +CH+NO	15,500,000	2.06	320,000	11,000	3.4
USA	16,000,000	2.72	440,000	30,000(*)	6,8
JAPAN	4,400,000	3.60	159,000	8,000	5.0
SOUTH KOREA	1,300,000	4.29	54,000	4,000	7.4

(*) Includes Defence and DoE Infrastructure costs



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INVITATION

A4M – MATCH Event with the European Parliament

The role of Materials Research and Innovation for European Growth & Competitiveness Towards a definition of the Mission concept

> European Parliament ASP ASE-2 17 October – 9.00 – 11.00



Registration: ferlaino@apre.it









- A "Manifesto" in support of a strong Materials Research and Innovation Dimension in FP9
- Why Advancing Materials are so important??
- 1. They are the enablers and the pillars of innovation of products and solutions for human wellbeing.
- 2. They are the *screw* to new sustainable growth for the European economy.
- 3. They are the nature element to boost transdisciplinary culture to the cross sectorial cooperation and citizens visibility that fill their benefit and their need;
- 4. They are the basis of any mission that aims to promote innovation, whatever the field considered
- 5. The multifunctionalities that we can exploit out of materials do serve different fields. Materials are real the metro stations that <u>allow us to change the lines</u>! without jeopardizing investment made, once they can serve fields with a multi attitude



What to do to keep Materials Momentum?

- a) A continuous dialogue among the main organizations active, directly and indirectly, in the area of Materials R&D&I and representing at EU level academia, research organizations, industry and institutions. <u>The</u> <u>philosophy of Materials Common House</u>
- b) Have an organization as A4M as system umbrella to assure the right ecosystem for achieving such structural dialogue.
- c) A robust and credible European growth based on technology will never be achieved without attention to a systemic scientific and industrial investment in Advanced Materials, once they are crucial whatever the innovation we think, independent on the field considered: Energy; Technologies of Information and Communication, Health, Security;
- d) We believe that every effort must be made to strengthen Europe's leading position in Materials science and technology, and that resources and long terms missions must be implemented to improve the competitiveness of Europe's advanced materials suppliers, user industries and citizens

Demands from A4M?

- i) A4M advocate by providing the relevant data to policy makers called to decide on the future FP.
- ii) To maintain a visible, strong and well oriented support to Materials R&D&I in the next EU FP as a key area for the Missions of the future.
- iii) A4M can contribute for Science Regulation concerning nanomaterials/particles and nanotechnologies;
- iv) To have a self-standing strong programme dedicated to Materials able to bridge the holes left on Horizon 2020 and to strength the key areas addressed there.
- v) <u>To show to policy makers</u> that Advanced Materials are the pivotal element for Europe's economic growth for a better quality of life development, minimizing the carbon footprint.
- vi) To assure that any horizontal, interdisciplinary and multisectorial aspects of Materials R&D&I will be properly produced in Europe and used before 2030.
- vii) Needs to have a central programme dedicated to <u>Advanced Materials</u> <u>operating as a hub</u> to ensure effective liaison with any Materials need from other sectorial, societal and multidisciplinary FP actions. This is the <u>great</u> <u>ambition and Mission expected from the field.</u>





Every society has been based & formed on their ability and capacity to **master** Materials!

For instance: Stone, Bronze, Iron Ages....!

Modern times – light alloys, composites, paper, glass, plastics, Si-chips, digital cameras etc etc

How does "innovations" appear?

Is it first a discovery phase?

Then followed by a technology phase?

Is the discovery process "programmed"?

Understand properties!Realize potential!How to fabricate?How to utilize?

Cellevate AB Imaging! Materials & Technologies & Market!

Electro-spinning! Quantum Devices! 3D printing!

Carbon nanotubes! Graphene! **Uppsalite!**

Discoveries in recent times!





INI



Uppsala University

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Everyone knows and agrees that:

Advanced Materials & KETs are needed for developing Europe!

KETs can be developed in two principal models:a) while being integrated in verticalsb) in a horizontal program with focus on the enabling perspectives.

To rapidly enhance innovation capacity and secure European industrial competitiveness only one model is useful....

Lars Montelius, Director General INL www.inl.int

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Lars Montelius, Director General INL www.inl.int

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THE EU-BASED INDUSTRY OF ADVANCED MATERIALS FOR CLEAN ENERGY & CLEAN MOBILITY TECHNOLOGIES IS A SOURCE OF GROWTH AND JOBS FOR EU

€	Revenues from operations in EU ~ 30 billion €	Manufacturing sites > 300	
	Direct jobs ~ 110.000 Direct & indirect jobs > 500.000	Researchers in industry ~ 5.000 researchers	I
	R&D spending ~ 800 million € * EMIRI interr	Capital expenditures ~ 2 billion € nal evaluation	

- But Advanced Materials display long, risky (market & technology) and capital-intensive innovation cycles that would benefit from appropriate risk-sharing at EU evel
- And global trends in energy & mobility are affecting the EU-based Industry of Advanced Materials (EU policies need to take these into account appropriately)



Global trends will positively impact manufacturing cost of clean energy & clean mobility techs making it possible to manufacture in EU to serve EU market



- 1. East Asia's shrinking cost advantage (Eastern Europe on the manufacturing map)
- 2. Advances in manufacturing technology (Industry 4.0) reducing labour & energy costs
- 3. More performant clean energy & clean mobility techs (leads to higher share of advanced materials in cost structure)
- 4. Congested maritime shipping routes leading to increase in shipping costs and risks



R&I needs to realize the EMIRI Vision for Europe **Perform R&I to reduce intrinsic cost of advanced materials** (euro/kg), **improve their** performance (energy unit/kg), increase lifetime and stability, ensure their competitive manufacturing & facilitate their integration into techs (several KETs are needed) Installation & Production (manufacturing) of ... operation of ... Leveraging existing **Renewable energy techs EMIRI's Strategic Energy storage techs Clean energy &** Innovation Agenda Advanced Raw clean mobility **Materials Materials** techs in the field (EMERIT) and enabling **Electro-mobility techs** Building the 4 strategic "decarbonisation" techs 3 waves of R&I are needed (EMIRI-promoted "Mission" proposes to focus on first 2 waves) priorities of EU's "Integration" of Advanced "Integration" of raw materials "Integration" of Integrated SET Plan Materials into clean techs technologies into into Advanced Materials (effective & efficient (intrinsic cost reduction, performance the field (system combination of Advanced increase, lifetime & stability, resource level innovation) Materials, competitive

manufacturing)

efficient & competitive manufacturing)



- Materials supporting major EU priorities:
 - Materials for a circular economy (their design, chr
 - Materials for an Energy Union
- Improving the eco-system for discovering, assessing & testing materials' new functionalities as well as integrating materials & production/utilization.
- Materials matching citizens requirements:
 - Medical technologies/materials to increase quality, accuracy, safety & ease of use of medical technologies
 - Materials for developing easy to use final products

Hélène Chraye, Martyn Chamberlain

European



EuMa7

Workshop in Lausanne, 15th November Travel to the Moon – Vision and Mission of Materials Experts

The experts discussed the **societal challenges** for a sustainable European Society in a Changing World Environment, Resource Efficiency and Secure Clean Energy:

•Health,

•Demographic Change and Well-being, Food and water security,

•Smart, Green and Integrated Transport,

•Secure Society

With a focus on **understanding of which materials** and **processing processes** would be important in order **to fulfil these visions** to fulfil the material's mission. A Document for EU Commission will be elaborated by FEMS, EUMAT with the Vision and Mission of Materials





> FEMS Workshop in Lausanne, 15th November Travel to the Moon – Vision and Mission of Materials Experts



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RELEVANT EVENTS after 12th May 2017

12th May, EUMAT SC Meeting EU Commission, Brussels
16th June Interplatform Event EU Commission, Brussels
3, 4th October Open Innovation Days, Brussels
5th October, EUMAT SC Meeting EU Commission, Brussels
17h October, Meeting European Parliament, Brussels
24-25th October, PV, CSP Workshop organized by EMIRI, Brussels
6th November, EMIRI Brockering Event, Brussels
7th November, EC-EDA Match-Making Event, Brussels
15th November, Lausanne Event
21st November, MATERPLAT, Spain

NEXT EVENTS 2017

22-24th November, Workshop Defense, Toledo, Spain
28-29th November, European Innovation Summit, EPPN, EMIRI
6-7th December, BBI Dissemination event
13th December, ECP4 Event, Brussels.
15th December, HPC in Materials for Energy