歐盟計畫
跨國徵求奈米材料科技於節能減碳及製程之應用計畫書
(M-ERA.NET 2-JTC2017)

歐洲公告網址: https://www.m-era.net/
線上申請網址: https://www.m-era.net/
尋求歐洲合作夥伴網址: https://www.nmp-partnersearch.eu/

壹、 緣起

歐盟 Horizon 2020 **M-ERA.NET 2** 計畫乃歐盟研究總署協調及整合歐洲各國科研主管機關，共同投入研發經費之跨國「**奈米材料科技於節能減碳及製程之應用**」計畫。**M-ERA.NET 2** 計畫乃由參與國的補助機構(Funding Agency)所組成，各國之 Funding Agency 自行編列研究經費，補助自己國家的研究人員參與研究計畫，以利促成「**奈米材料科技於節能減碳及製程之應用**」跨國研究團隊之形成，避免各國資源重複投資並集各國家所長共同研究。

本部參與歐盟 **M-ERA.NET 2** 計畫，與歐洲各國同步公開徵求計畫書，細節請參閱 **M-ERA.NET 2** 網站- https://www.m-era.net/)英文版之公告檔案，本次公開徵求之主題為:

Topic 1:	**Integrated Computational Materials Engineering (ICME)**
Topic 2:	**Innovative Surfaces, Coatings and Interfaces**
Topic 3:	**High Performance Composites**
Topic 4:	**Multifunctional Materials**
Topic 5:	**New Strategies for Advanced Material-based Technologies in Health Applications**
Topic 6:	**Materials for Additive Manufacturing**

科技部 Ministry of Science and Technology

European Commission

M-era.Net

歐盟 M-ERA.NET 2 計畫參與之機構

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6
Austria: FFG-BP		x		x	x	
Austria: FFG-TP	x		x			x
Belgium Flanders: VLAIO	x	x	x	x	x	x
Belgium Wallonia: DGo6	x	x	x	x	x	x
Bulgaria: BNSF	x	x	x	x	x	x
Brazil Sao Paulo: FAPESP	x	x	x	x	x	x
Cyprus: RPF	x	x	x	x	x	x
Estonia: ETAg	x	x	x	x	x	x
Finland: Tekes	x	x	x	x	x	x
France: Nouvelle-Aquitaine	x	x	x	x	x	x
Germany: Programmes		x	x	x		x
Hungary: NKFIH	x	x	x	x	x	x
Iceland: RANNIS						
Israel: MOST	x	x	x	x	x	x
Italy: Regione Calabria	x	x	x	x	x	x
Korea: KIAT	x	x	x	x	x	x
Latvia: VIAA	x	x	x	x	x	x
Lithuania: RCL	x	x	x	x	x	x
Luxembourg: FNR	x	x	x	x	x	x
Netherlands: M2i	x	x	x	x	x	x
Poland: NCBR	x	x	x	x	x	x
Poland: NCN (participation pending confirmation)						
Romania: UEFISCDI (participation pending confirmation)	x	x	x	x	x	x
Russia: FASIE	x	x	x	x	x	x
Slovakia: SAS	x	x	x	x	x	x
South Africa: DST	x	x	x	x	x	x
Spain Asturias: IDEPA	x	x	x	x	x	x
Spain Castile-Leon: ADE	x	x	x	x	x	x
Spain Andalucía: IDEA	x	x	x	x	x	x
Spain Madrid: fmi+d (participation pending confirmation)	x	x	x	x	x	x
Switzerland: SBFI	x	x	x	x	x	x
Taiwan: MOST	x	x	x	x	x	x
Turkey: TÜBITAK	x	x	x	x	x	x

貳、 申請資格

一、公私立大專校院、公立研究機構。

二、經本部認可之財團法人學術研究機構、醫療社團法人學術研究機構。

三、計畫主持人需符合「科技部補助專題研究計畫作業要點」規定。

四、**請詳閱本公告第玖點:「注意事項」**。

參、 補助經費

我國研究團隊依本次計畫徵求公告申請 **M-ERA.NET 2** 研究計畫並獲審查通過後，得向本部提出申請經費補助，本部比照歐盟計畫方案辦理補助。每件獲審查通過之 **M-ERA.NET 2** 研究計畫:

一、 補助上限: 新台幣 300 萬元/年(分項)[1]。

二、 計畫期限: 最多不超過 3 年。

三、 實際補助金額經本部進行經費審查後核定。

肆、 補助項目

一、 國外差旅費(含移地研究費)。

二、 業務費: 研究人力費(含專任助理、研究生或助理津貼、臨時工資等)、耗材、物品及雜項費用，及補助國外學者來台費用。

三、 管理費 (上限 8%)。

伍、 計畫件數

一、 我方計畫主持人參與歐盟 **M-ERA.NET 2** 計畫得以 1 件計畫不列入本部專題研究計畫件數計算，惟將列入本部「雙邊協議專案型國際合作研究計畫」件數計算。

二、 申請人目前主持 2 件本部「雙邊協議專案型國際合作研究計畫」，且其計畫執行日期均與本次徵求案之預定執行迄日重疊達 3 個月以上者，得不受理申辦補助。

[1] 此 **M-ERA.NET 2** 計畫目前規範單一研究計畫必須由 3 個團隊所組成，3 個團隊當中必須包含至少 2 個 **M-ERA.NET 2** 計畫參與國，且必須至少有 1 個 **M-ERA.NET 2** 計畫參與國是歐盟會員國或是其協議國家。但並未限制單一國家僅能有一個團隊參與一個研究計畫，故如我國有兩個團隊參與同一個計畫，如於該計畫中執行不同**分項**，則可各別向本部申請補助新台幣 300 萬/年(上限)，或合併向本部提出一整合型計畫，向本部申請補助新台幣 600 萬/年(上限)，惟必須能夠清楚分辨出分項及工作內容的差異。

陸、 申請方式及運作模式

一、 所有歐盟 **M-ERA.NET 2** 計畫參與國之 Funding Agency 同步於 **2017 年 3 月 14 日**公開徵求第一階段的構想書(Pre-Proposal)，並將於 **2017 年 6 月 13 日**截止收件，每 1 件計畫必須由多國團隊(至少由 2 國及 3 個團隊)所組成，並委任 1 位擔任計畫主持人 Coordinator (我國亦可以擔任 Coordinator)，共同撰寫 1 份計畫申請書，並統一由計畫主持人 Coordinator 線上繳交送出申請。

M-ERA.NET 2 計畫線上申請系統網址如下，**有意申請計畫者請透過下列網址登入線上申請系統**。

網址: https://www.m-era.net/

二、 擬申請 **M-ERA.NET 2** 計畫者請自行尋求合作夥伴並組成團隊一起申請(Build Your Consortium)，或自行擔任 Coordinator 協調國外團隊或參與國外團隊的計畫皆可。

三、 擬申請計畫者請確認符合下列所有歐盟 **M-ERA.NET 2** 計畫所訂定之申請資格(Eligibility Criteria)及同時必須符合本部的申請資格(例如: 必須是本部受補助單位及所提經費不得超過本部所設之上限等)。

四、 獲審查通過推薦之 **M-ERA.NET 2** 研究計畫，將由參與歐盟 **M-ERA.NET 2** 計畫之 Funding Agency 自行補助自己國家研究團隊所需之經費，我國之研究團隊/人員所申請或參與之計畫如最後獲審查推薦者，則由本部補助我國團隊所需之研究經費。

五、 1 件計畫只需線上提送 1 份計畫申請書(由多國團隊共同撰寫)，故如我國研究人員與歐洲研究人員共同組成 1 隊並由歐洲人員擔任計畫主持人(Coordinator)，則由歐洲計畫主持人(Coordinator)線上一併提出 Pre-Proposal，我方則配合計畫團隊所需提供計畫相關資料；如我方乃計畫之計畫主持人(Coordinator)，則必須協調歐洲團隊提供資料，並由我方於指定時間內線上提出申請。

六、 請依附件 Pre-Proposal 格式完成構想申請書，於 **2017 年 6 月 13 日前上傳[2] 構想書(Pre-Proposal)至 M-ERA.NET 2 計畫線上申請系統**；**並以 Email 方式寄至本部自然司王心頎小姐。** (soa145@most.gov.tw)。

七、 受理申請之 **M-ERA.NET 2** 研究計畫將經 2 階段的審查: 分別為第 1 階段 Pre-Proposal 及第 2 階段 Full-Proposal。第 1 階段 Pre-Proposal 是先由各 **M-ERA.NET 2** 計畫之參與國/機構所組成，按照 **M-ERA.NET 2** 之規範執行資格審查 (Eligibility Check)及初審，我國所申請或參與之 **M-ERA.NET 2** 計畫**則由本部辦理資格審查及初審作業**，本部將於 2017 年 6 月 13 日 Pre-Proposal 截止收件後另擇日安排初審會議，邀請我國參與 **M-ERA.NET 2** 研究計畫之團隊以現場簡報方式向審查委員簡報計畫之內容及概要，並接受審查委員之諮詢**(面審)**。

八、 **M-ERA.NET 2** 計畫各參與國於執行初審結束後，將針對每一件自己國家所參與的計畫做出下列判斷:

(一)推薦該計畫進入第二階段並邀請該計畫撰寫 Full-Proposal。
(二)推薦該計畫進入第二階段惟必須納入審查委員之修正意見。
(三)不推薦該計畫進入第二階段(審查委員提供評語及說明)

九、 每件 **M-ERA.NET 2** 計畫必須由至少兩個 **M-ERA.NET 2** 計畫的參與國所組成，每一件 **M-ERA.NET 2** Pre-Proposal 必須獲得至少兩個參與國之 Funding Agency 推薦才能進入第二階段，並獲邀請撰寫 Full- Proposal。如低於兩個 Funding Agency 推薦之 Pre-Proposal 則被視為未獲推薦。

十、 通過第一階段(Pre-Proposal)審查且獲推薦計畫之主持人將會獲得正式書信通知，並獲邀於 **2017 年 11 月 9 日**前於指定的線上申請系統上繳交完整計畫書(Deadline for Submission of Full-Proposal)。

十一、 所有進入第二階段 Full-Proposal 之計畫，每件計畫將委由 3 位審

[2] 申請一律採線上作業，從公告內所指定之網站上繳交送出。

查委員[3]個別執行書面審查，其中一人將擔任該計畫之報告人，報告人必須彙整及評估 3 份書面審查結果並出席各國 Funding Agency 所辦理之 Full Proposal 審查會議中進行報告。

十二、 所有進入第二階段 Full-Proposal 之計畫將在每件計畫之報告人與會討論後，綜整評估並針對所有 Full-Proposal 產出 1 份計畫優先推薦排序表。**M-ERA.NET 2** 計畫參與國之 Funding Agency 將討論並決定通過 Full Proposal 之件數(按照優先推薦的計畫排序表辦理以及各國可投入之經費而判斷)。

十三、 通過第二階段(Full- Proposal)審查且獲推薦之 **M-ERA.NET 2** 研究計畫將於 **M-ERA.NET 2** 網站上公告，計畫主持人亦會收到正式書信通知，如我國所參與之研究計畫經第二階段(Full- Proposal)審查後獲推薦者，經聯繫本部承辦人後，可透過本部線上專題研究計畫系統提出申請(隨到隨審)，並由本部進行經費審查後核定補助經費。

十四、重要日期時間表

下表為 **M-ERA.NET 2** 委員會暫定之時間表，如執行期間有修正，將在 **M-ERA.NET 2** 網站上公告更新的時程。

Date	Step
14 March 2017	Launch of the Call 2017
13 June 2017	Deadline for submission of Pre-Proposals
19 June 2017	Quick check access to monitoring tool list of proposals
5 September 2017	National/regional Pre-Proposal checks completed and provided online via IT tool
12 September 2017	Coordination Meeting and feedback to applicants
9 November 2017	Deadline for submission of Full-Proposals
20 November 2017	Deadline for national/regional eligibility checks of Full-Proposals
21 November 2017	Start of central evaluation of Full Proposals
19 December 2017	Deadline for individual assessments by international evaluators
12 January 2018	Deadline for compilation of consensus report (online discussions and peer review report finished)

[3] 由各國所推薦之中立專家學者所組成。

16 January 2018	Peer review reports and ranking list to call consortium
26 January 2018	National/regional commitment for funding finished (provided online via IT tool) resulting in a preliminary selection list
30 January 2018	Selection Meeting – coordination of national/regional funding recommendation for final M-ERA.NET selection list
8 February 2018	Feedback to applicants
from May 2018	Contract negotiations for selected proposals on national/regional level
from May 2018	Start of funded projects

柒、本次歐盟 **M-ERA.NET 2** 公開徵求計畫之 6 大主題:

Topic 1: Integrated computational materials engineering (ICME)

Technical content/scope

Current developments in combinatorial synthesis and multi-scale modelling together with high throughput or multi-scale experimentation allow for a faster development of materials targeted to both enhanced performance and processing. Knowing the influence of manufacturing routes in final material properties, process modelling will be considered as well. Thus, modelling of interfaces between components should be addressed. Moreover, better input data identification will be targeted in order to improve predictive models. A skilful combination of these approaches in terms of Integrated Computational Materials Engineering will lead to significant improvements in our ability to design new materials or to assess materials performance already in the product development stage.

The proposals should focus on either of the following model-driven schemes:

a) Design of new materials with properties targeted for specific applications,

or

b) Tailoring microstructural and interface changes of known materials to obtain new or improved properties,

or

c) Creating or improving tools to advance virtual design, virtual testing or virtual manufacturing.

Objectives

The proposals should address one or several the following items:

1) **Material constitutive modelling:** Use of materials physics-based design principles in a computational environment, bridging the gap between different time and/or length scales.
2) **Modelling of interfaces between components:** part and tooling in process manufacturing, adhesive bonding, diffusion-induced compositional gradients, etc.

3) **Identification of input parameters** (mechanical, thermal, electrical...) for modelling and their integration into models.
4) **Computational simulation of material behaviour including material processing**
5) **Experimental validation of model results across multiple length scales**. The proposals should clearly present the approach taken for relating the above items.
6) **Target properties:** Definition of specific goals to be reached, by defining criteria. For schemes
    a) and b) the criteria need to be quantitative target properties.

Expected impact

The proposal should address how it will contribute to the expected impact of the topic, defined as follows:

- Improved predictive power of Integrated Computational Materials Engineering by the use of improved input data, leading edge methodology, and considering interfaces between components and the manufacturing process.
- Establishment of well-targeted materials design and process definition.
- Building and strengthening a common European research community in the area of Integrated Computational Materials Engineering.
- Increased competitiveness of the European industry, allowing cost saving in materials design and processing, as well as a shortened time-to-market for materials with advanced properties.
- Better predictive modelling of material behaviour and its processing through the use of improved data.
- Improvement of material performance through modelling innovative material processing.
- Proposals should clearly demonstrate credible benefits in engineering applications areas for the materials/processes/properties developed through ICME.
- Projects within this topic could be basic or applied research (TRL target for project deliverables within levels 2-5).

All proposals should clearly state the Technology Readiness Level (TRL) at the project start and at the project end (see 1.3.). In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL 4 and below should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end) and demonstrate industrial involvement, for example by establishing an industrial advisory board or by the participation of one or more companies in the project consortium. For proposals aiming above TRL 4, industrial partners should be involved in the project consortium.

Target groups

This topic is targeted at all groups in the innovation chain: basic research, applied research, industrial R&D. The topic is particulary suitable for the establishment of a strong collaboration between research entities, SMEs and large industry.

Keywords

ICME, constitutive modelling, computational simulation, experimental validation, multiple length scales, input parameter identification, manufacturing processes.

Targeted TRL: 2-5

Topic 2: Innovative surfaces, coatings and interfaces

Technical content/scope

Surface and coating technology is a key enabler for new solutions in numerous industrial sectors in Europe. This call will stimulate application driven development of innovative surfaces, multifunctional coatings and understanding of interfaces and related processes such as joining, interface mixing and dissolution/corrosion. Extreme operating conditions include, but are not limited to: temperature, mechanical load, corrosion, chemical environment, bacteriological agents and radiation.

The target properties addressed in this call include but are not limited to: tribological, mechanical, corrosion resistance, anti-bacterial, optical, electromagnetic, controllable anti-/adhesive and wettability properties, catalytic characteristics, self-responsiveness and multifunctionality, bioinspired approaches, taking into account both processing and final product specifications.
In particular, energy-related coating properties are encouraged to be addressed in the sector of wind, PV, concentrated solar cells (CSC), geothermal energy, bioenergy, fossil fuel energies, nuclear energy, energy harvesting, energy efficient materials (EEM) for buildings and energy storage. The proposals should also consider the processing aspect of the new technology aiming for flexible and energy-efficient approaches in production with smart use of materials (saving resources and tailoring applications) in an environmentally friendly manner.

Objectives

The objective of the call is:

- To develop innovative or significantly improved coatings, interfaces and processes by chemical and/or physical surface modification for extreme operating conditions.
- To generate new insights in surface modification, manufacturing, and tailoring of (multi-) functional coatings by a holistic understanding of the relationship of materials – processes – technological properties – applications. Enabling a new generation of engineered surfaces with improved property profiles and target specs.

Project proposals should:

- Address innovative surface modification and coating solutions, consider innovative processing routes or new concepts for coating and surface treatment.
- Focus on one or several of the following points:
  - Interdisciplinary process combinations,
  - Innovative surfaces and coating materials and processes to join them,
  - Nanomaterials,
  - Surfaces with sensor capabilities,
  - Structured surfaces,
  - Composite coatings or multilayers.

- Bioinspired approaches
- Consider addressing aspects such as: basic understanding of the mechanisms, experimental assessment, prototyping, up-scaling, manufacturing and validation with a view to final customer applications.

In order to ensure relevance for different partners in the value chain, the proposal should state clear concepts for application(s) and targeted industrial sector(s).

Expected impact

- Innovative components/products with tailored properties or functionalities by tuned surfaces and coatings for extreme operation conditions.
- A positive ecological and energy impact in terms of avoidance of hazardous materials and compounds by developing processes, coating materials, technology and product life cycles following a circular economy strategy.
- The proposals should address innovative products or technologies based on functionalised surfaces and coatings that might have strong societal impact, on e.g. safety, economics, employment and life quality, and is encouraged to result in synergies between industry and academia.

All proposals should clearly state the Technology Readiness Level (TRL) at the project start and at the project end (see 1.3.). In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL 4 and below should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end) and demonstrate industrial involvement, for example by establishing an industrial advisory board or by the participation of one or more companies in the project consortium. For proposals aiming above TRL 4, industrial partners should be involved in the project consortium.

Target groups

This topic is targeted at all groups in the innovation chain: basic research, applied research and industrial R&D. The topic is particulary suitable for the establishment of a strong collaboration between research entities and SMEs. Participation of large industry is encouraged e.g. as potential end user of the technology proposed.
Interdisciplinary projects are encouraged and should enable a broader cross-sectorial use.

Keywords

Functionalised surfaces, (multi)functional coatings, innovative surfaces, coating materials and processes to join them, nanomaterials, anti-bacterial coatings, self-responsive coatings, surfaces with sensor capabilities, structured surfaces, (nano)composite coatings and multilayers, extreme temperature, extreme pressure, extreme mechanical load conditions, corrosive media, bacterial interactions, high or low friction, environments with radiation.

Targeted TRL: 2-6

Topic 3: High performance composites

Technical content/scope

Within the scope of this call, composites are defined as engineered materials, including hybrids, composed of two or more constituents, for example, a polymer matrix reinforced by a fibre or filler that meets the requirements which cannot be otherwise fulfilled by one component alone. The matrix, fibres and fillers can be synthetic or bio-based.

Objectives

The call is aimed at high performance composites having functional properties that meet the target applications in transportation, construction, packaging and medical devices as well as other engineering applications with a particular emphasis on energy (consumption reduction, storage and production).

The new developed composites should address several of the following functionalities:

- High strength and stiffness to weight-ratio
- Durability (e.g. good resistance to creep, fatigue, wear, tribocorrosionhumidity, etc.)
- Tailored thermal and electrical properties, high strength at elevated temperatures (aircraft use)
- Self-healing properties
- Biocompatible and/or anti-bacterial
- Biodegradable and compostable
- Fire retardant properties with environmentally friendly additives

The research proposals could also address the following material design and manufacturing issues:

- Novel and unique knowledge in molecular design, functionalization and characterization of a wide range of fibre or filler (nano or micro) reinforced composite materials for composites with improved reinforcement/matrix interaction
- Development of new biobased resins and/or biobased fibres or fillers
- Methodology and tools for design-optimisation
- Scalable and rapid manufacturing, for example material innovations could encompass fast curing, low viscosity resins, stampable thermoplastic composite sheets.
- Automation and robotisation
- Modelling and simulation of processing including multi-scale approaches
- Joining, assembly and repair including joining of dissimilar materials (hybrid structures)
- Visible signs of overstressed/damaged structures,
- Structural health monitoring
- Composite end-of-life technologies.

To strengthen the whole innovation chain it is strongly recommended that the project proposal covers materials, processing and application development of composites. Such integration could be further enhanced by fostering collaboration between universities and

industry, and by a consortium covering the whole value chain.

Expected impact

- More competitive industrial products and processes using the advanced materials design and manufacturing concepts.
- Socio-ecological benefits provided by products with higher integration level of functionality, lighter products to transport, lighter dynamic applications to decrease energy consumption, and by using materials that will result in a lower environmental impact.
- Because the composites industry is characterised by a large number of scattered players, including SME manufacturers and equipment suppliers, the projects should improve the sharing of knowledge and reinforcing both technological and scientific platforms.

All proposals should clearly state the Technology Readiness Level (TRL) at the project start and at the project end (see 1.3.). In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL 4 and below should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end) and demonstrate industrial involvement, for example by establishing an industrial advisory board or by the participation of one or more companies in the project consortium. For proposals aiming above TRL 4, industrial partners should be involved in the project consortium.

Target groups

This topic is targeted at all groups in the innovation chain: basic research, applied research, industrial R&D. The topic is particulary suitable for the establishment of a strong collaboration between research entities, SMEs and large industry.

Keywords

Biobased composites, synthetic composites, hybrid material systems, functional properties, in-service behaviour, design methodology, process technology, process modelling, material behaviour modelling.

Targeted TRL: 2-6

Topic 4: Multifunctional materials

Technical content/scope

Advanced functional materials are, and should remain, an important economic and employment generator in Europe. Multifunctional materials, as opposed to structural materials, are a major bottleneck for almost all technologies. Designing of materials and microstructures with tailored properties is needed to achieve high performance in industrial applications, especially when considering long term functionality. Special attention must be paid to the requirements for application conditions referred to energy technologies.

Currently over 80 % of Europe's energy use is based on oil, gas and coal. The European Strategic Energy Technology Plan (SET Plan) recognises this situation and emphasises the growing need for cost-competitive low carbon energy and energy efficiency technologies. The SET Plan Materials Road Map emphasises the pivotal enabling role of advanced materials and clearly outlines the medium to long term strategy for the coming years.

Objectives

The scope of this call is to develop advanced multi-functional materials or material systems with improved physical, chemical and/or mechanical properties leading to advances in the following areas:

- *Materials for ICT and industrial sensing and actuation*

Smart materials/metamaterials with controlled electrical, magnetic, thermal, optical, and mechanical properties enabling low power (towards zero power) device/systems in ICT, industrial sensing and actuation applications. Critical raw materials (f.e. rare-earths in permanent magnets, Pt group materials, others) replacement where needed should be addressed.
(Targeted TRL: 3-4)

- *Construction materials, building environments*

Advanced/smart thermal insulation materials, advanced/smart window concepts, active paints, advanced illumination concepts, efficient heat radiation solutions.
(Targeted TRL: 5-6)

- *Intensive industrial sectors (chemicals, cement, glass, pulp and paper, others).*

Materials based energy-conversion solutions for plant by-products and residues. Materials recycling solutions. Heat upgrading e.g. by thermoelectric conversion.
(Targeted TRL: 5-6)

- *Electrochemical and chemical energy storage*

New materials for use in rechargeable ion batteries, alternatives to graphite electrodes, new non-carbon based nanomaterials for supercapacitors, ionic and electronic conductors for new electrochemical storage concepts. New hydrogen generation and storage materials
(Targeted TRL: 3-4)

- *Flexible energy storage devices*

Solid state batteries and capacitors that can integrate with wearable electronics
(Targeted TRL: 3-4)

- *Energy harvesting materials and solutions*

New energy harvesting solutions based on advanced thermoelectric, piezoelectric, magnetostrictive or chemical concepts. New architectures for increased energy efficiency.
(Targeted TRL: 3-4)

- *Photovoltaics*

Improved architectures for thin film solar cells, including micro concentrators, passivation layers, controlled composition gradients, others. Colored and white PV panels for architectural integration. Replacement of toxic, or critical materials where possible. Novel solar cell materials (nano based concepts, others).
(Targeted TRL: 5-6)

The research proposals should give sufficient attention to mid- or long term industrial feasibility, reliability, durability and environmental compatibility. The materials development should aim to a clear and quantified improvement in performance, cost reduction and sustainability towards critical raw materials use.

A proposal must consider, demonstrate and clarify its added value and impact, and where appropriate, its alignment with the SET Plan materials Roadmap. For basic research programs (lower TRL), radically new concepts should be proposed and demonstrated with respect to the state of the art**. In case the research proposal intends to make use of critical and potentially scarce raw materials -see critical raw materials for EU[4] - the applicants are requested to present a justification for this choice.** Projects may also address substitution or recycling of such critical or scarce materials.

Expected impact

- Ensure the future European energy supply through technological development based on

novel multifunctional materials

- Support the European strategic policy targets in terms of greenhouse gas emission reduction and developing affordable sustainable energy sources and usage.
- Improved competitiveness and strengthened industrial leadership.
- Strengthened innovation excellence of the European academia and research institutes.

All proposals should clearly state the Technology Readiness Level (TRL) at the project start and at the project end (see 1.3.). In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL 4 and below should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end) and demonstrate industrial involvement, for example by establishing an industrial advisory board or by the participation of one or more companies in the project consortium. For proposals aiming above TRL 4, industrial partners should be involved in the project consortium.

Target groups

This topic is targeted at all groups in the innovation chain: basic research, applied research, industrial R&D. The topic is particulary suitable for the establishment of a strong collaboration between research entities, SMEs and large industry. Consortia focusing only on basic research or industrial R&D are also eligible.

Keywords

Advanced functional or multifunctional materials, improved properties (electrical, magnetic, optical, chemical, thermal, mechanical), nano/microstructured materials, energy efficiency)

Targeted TRL: 3-6

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http://www.catalysiscluster.eu/wp/wp-content/uploads/2015/05/2014_Critical-raw-materials-for-the-EU-2014.pdf

Topic 5: New strategies for advanced material-based technologies in health applications

Technical content/scope

Wellness and healthy ageing of the European population require new or improved solutions to health-related issues. Many of these solutions will come from the development of new advanced materials as key components of therapeutics (drug delivery systems, implants, tissue regeneration strategies, cell and gene therapies, etc.), diagnostics (contrast agents, implantable devices) and theranostics. These materials will be in contact with the human body at different levels and different time scales.

The purpose of this call topic is to provide opportunities to advance material-based technologies towards clinical evaluation and market applications. This action is aligned with societal challenges regarding "Health, Demographic Change and Wellbeing" as defined in the H2020 framework. It is also in agreement with the recognition of advanced materials as a Key Enabling Technology for strengthening the competitiveness of the European industry.

Objectives

The main objective is to obtain a better understanding of the functionality of biomaterials and interactions with their biological hosts (e.g. organs, body tissues, cells and human bio-fluids). Materials investigated should target at least one clinically relevant application.

Proposals must address one or more of the following:

- Interactions between biomaterials and biological hosts with specific focus on hierarchical structures and/or multiple time scales.
- Targeting cells, tissues, organs with novel drug delivery systems
- Material-related biological/medical topics such as inflammation, infection, biofilm formation and biodegradation.
- In vivo sensor and actuation systems
- Combined diagnosis and therapy approaches (theranostics)
- Novel, materials-based technologies for 3D tissue model engineering
- The crossing of biological barriers such as blood brain barrier, digestive system, skin barrier or cell membranes.
- Understanding of the impact of the sterilisation process on biomaterials.
- Impacts of the preservation processes on biological entities (e.g. organs, body tissues, cells and human bio-fluids) on *in vitro* and *ex vivo* investigations.
-

Successful proposals are expected to take into account the following:

- The potential market and exploitation routes including scalability.
- A report on relevant regulatory issues.

Moreover, the proposals are strongly encouraged to consider the following issues:

- Where appropriate the *in vitro* testing and/or assays in small animals should be conducted following the bio-ethical committee rules of each centre.
- Cross-collaboration between materials scientists, biologists, medical doctors and industrial partners.

Expected impact

- Understanding the complexity of biomaterials' interfaces at hierarchical structures and/or multiple time scales going far beyond the current state of the art.
- Achievement of new or improved materials' performance for health applications.
- Higher competitiveness of the European health industry through more reliable products and processes.
- Improved market access through increased awareness of the regulatory protocols.
- Increased collaborations between materials science RTD performers, industrial and medical stakeholders in the health sector.
- At the end of the project the technology being addressed is expected to reach TRL 4 (see 1.3.).

All proposals should clearly state the Technology Readiness Level (TRL) at the project start and at the project end (see 1.3.). In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL 4 and below should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end) and demonstrate industrial involvement, for example by establishing an industrial advisory board or by the participation of one or more companies in the project consortium. For proposals aiming above TRL 4, industrial partners should be involved in the project consortium.

Target group

This topic is targeted at all groups in the innovation chain: basic research, applied research, industrial RTD. Collaboration between research entities, SMEs and large industry is encouraged.

Keywords

Biomaterials, biointerfaces, biofilms, biodegradation, nanotechnology, implants, scaffolds, sterilisation, targeted drug delivery, in vivo sensing, cell or organ preservation, additive manufacturing, therapeutics, diagnostics, theranostics

Targeted TRL: 2-5

Topic 6: Materials for additive manufacturing

Technical content/scope

Additive Manufacturing (AM) is a process of directly building 3D parts and components based on a digital model usually by adding material layer by layer. AM is a rapidly developing industrial sector and, potentially, a disruptive technology. This is because, in principle, it is material and energy effective and sustainable compared to subtractive technologies. However, the full exploitation of 3D AM processes is currently limited due to

the in-service performance of the available materials' sets. Within this call, proposals should focus on the development of materials specifically for use in AM processes and leading to required performance, reliability and economics of manufactured components.

Objectives

The objective is to develop innovative metallic, ceramic, polymeric and composite materials designed for use in AM processes (e.g. tuning composition, structure, morphology, powder-processing parameters etc.) and advanced production systems in order to confer improved or modified properties for manufactured products. . The final goal of proposed projects should be to demonstrate the ability of new materials and processes to achieve finished components exhibiting improved performance, reproducibility/reliability, preferably with reduced life cycle costs.
Project proposals should address materials and production processes for final part production. This could include e.g. mechanical and corrosion properties, surface finishing, internal stress reduction, electrical and thermal conductivity, materials specifically designed to exploit the potential of AM systems, and (in-situ) quality assurance tools. Proposals should also discuss energy related aspects of the research.

Examples of proposals that could be considered eligible under this call include, but are not exclusively confined to:

- Development of materials and processes designed to overcome off-thermodynamic equilibrium problems like non-equilibrium surface and interface compositions and phases, relating e.g. to cracks or internal stress in AM parts.
- Development of materials for the AM production of components for use in extreme environments.
- Materials for use in the production of improved scaffolds used in medical applications.
- Development of materials and processes that enable effective re-use of feedstock materials.
- Development of novel materials and processes to enable innovative applications for AM parts, which could include functionally graded or composite materials.
- New materials for energy efficiency AM applications, such as heat exchangers with complex geometry.
- Development of fibre-reinforced polymeric materials for lightweight structural AM applications.
- Processes that target quality assurance aspects in the manufacturing process

Expected impact

- Development of materials for the production of reliable AM parts/components suitable for specific application classes.
- New feedstocks (e.g. powder, wire, filament) specifically developed to enhance functionality, reliability and performance.
- New process technology for the production of AM parts with novel materials.
- New process technology adapted to the production of new AM-specific feedstock materials.

- All proposals should address any environmental, social or ethical impacts where relevant.
- Projects within this call could be basic or applied research (TRL target for project within levels 3-7).

All proposals should clearly state the Technology Readiness Level (TRL) at the project start and at the project end (see 1.3.). In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL 4 and below should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end) and demonstrate industrial involvement, for example by establishing an industrial advisory board or by the participation of one or more companies in the project consortium. For proposals aiming above TRL 4, industrial partners should be involved in the project consortium.

The use of living biological materials as part of the AM process is not covered by this call.

Target group
This topic is targeted at all groups in the innovation chain: basic research, applied research, industrial R&D. Collaboration between research entities, SMEs and large industry is encouraged as is participation in project consortia by international organisations.

Keywords
Materials development; 3D printing; Additive Manufacturing; Component properties; Production; Polymers; Metals; Ceramics; Composites; Feedstock; Applications; Life cycle costs; Materials efficiency; Recycling; Quality assurance.

Targeted TRL: 3-6

捌、Technology Readiness Level (TRL)對照表

Technology Readiness Level

All proposals should clearly state and motivate at what level on the Technology Readiness Level (TRL) scale the project is situated at the beginning and after the project is finished. In order to increase the potential for new business opportunities and commercial exploitation of the results, proposals aiming at TRL below 4 should include a plan for the transition to higher TRL's at a later stage (i.e. beyond the project end date) and demonstrate industrial involvement. This can be realised by establishing an industrial advisory board (or alternatively by the participation of one or more companies in the project consortium when feasible). For proposals aiming at TRL above 4, industrial partners should be involved in the project consortium.

Where the topic description refers to the concept of **"Technology Readiness Level"**

(TRL), the following definition in accordance with H2020[5] applies:

TRL 1 – basic principles observed
TRL 2 – technology concept formulated
TRL 3 – experimental proof of concept
TRL 4 – technology validated in lab
TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7 – system prototype demonstration in operational environment
TRL 8 – system complete and qualified
TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

In the project proposal, it should be indicated what is the TRL position in the beginning of the project and after the project is finished.

Topic	TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
Integrated Computational Materials Engineering									
Innovative Surfaces, Coatings and Interfaces									
High performance composites									
Multifunctional Materials									
New strategies for advanced material-based technologies in health applications									
Materials for additive manufacturing									

玖、注意事項

一、 每件計畫必須由**最少 3 個團隊，並從至少 2 個 M-ERA.NET 2 計畫參與國所組成**，且必須**至少**有 1 **個 M-ERA.NET 2** 計畫**參與國**是**歐盟會員國國家或是其協議國家**，並未限制 **M-ERA.NET 2** 計畫參與國僅能有一個團隊參與一件計畫，單一研究計畫的執行期限最多不得超過 3 年。

二、 每件 **M-ERA.NET 2 研究**計畫的組成可包含**非 M-ERA.NET 2 計畫**參與國自費參加的團隊，惟前提是仍必須符合**最少已有 3 個團隊從至少 2 個 M-ERA.NET 2 計畫參與國所組成**，且必須**至少**有 **2 個 M-ERA.NET 2** 計

[5] See p. 27
http://ec.europa.eu/research/participants/portal/doc/call/h2020/common/1597678-part_18_general_annexes_incl_corr_en.pdf

畫參與國是歐洲國家之基本規定。

三、 每件 **M-ERA.NET 2** 研究計畫必須有 1 位計畫主持人(Coordinator)，且計畫主持人必須由 **M-ERA.NET 2** 計畫參與國家中的團隊擔任，我國亦可擔任 **M-ERA.NET 2** 研究計畫之計畫主持人(Coordinator)。

四、 歐盟 **M-ERA.NET 2** 計畫審查將針對每一個審查要點採分數(最高 5 分)制辦理，次審查要點(Sub-Criteria)容許採用 0.1 分制以區隔每件計畫的差異。每一個審查要點不得低於 3 分，且彙整三個審查要點分數之總和不得低於 10 分。

Main Criteria	***Sub Criteria***	***Score (points)***
Excellence	*Clarity and pertinence of the objectives;*	*max. 1.5*
	Credibility of the proposed approach and soundness of the concept	*max. 2.0*
	Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art (e.g. ground-breaking objectives, novel concepts and approaches	*max. 1.5*
Impact	*Contribution at the European or international level to the expected impacts listed in the work programme under the relevant topic*	*max. 2.5*
	Enhancing innovation capacity and integration of new knowledge;	*max. 1.0*
	Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets; and, where relevant, by delivering such innovations to the markets;	
	Any other environmental and socially important impacts (not already covered above);	
	Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant	*max. 1.5*
Quality and efficiency of the implementation	*Appropriateness of the management structures and procedures*	*max. 1.0*

	Quality and relevant experience of the individual participants	*max. 1.0*
	Quality of the consortium as a whole (including complementarity, balance)	*max. 1.0*
	Appropriate allocation and justification of the resources to be committed (budget, staff, equipment)	*max. 2.0*

五、 通過審查且獲得補助之計畫團隊必須簽署團隊協議(Consortium Agreement)

六、 每件獲推薦且補助之 **M-ERA.NET 2** 研究計畫，計畫主持人必須繳交期中報告及期末報告。所有報告必須用英文撰寫，不同國家之計畫成員必須配合計畫主持人(Project Coordinator)之協調繳交英文版之研究分項執行資料。

七、 本部核定通過之 **M-ERA.NET 2** 研究計畫，請依本部專題研究計畫相關規定繳交研究成果及結案報告(建議用英文書寫，因為 **M-ERA.NET 2** 研究計畫團隊會向計畫成員索取 1 份)。本部亦得請我國計畫主持人至本部指定場合口頭報告，或配合本部辦理實地考評審查。

八、 本徵求公告未盡事宜，應依「科技部補助專題研究計畫作業要點」、「科技部補助專題研究計畫經費處理原則」及其他相關規定辦理。

九、 申請本計畫無申覆機制，一切依照歐盟制定之審查機制及各國公認的程序及方式辦理(與所有參與 **M-ERA.NET 2** 計畫會員國適用相同標準)。

玖、承辦人

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