

# 104 年度科技部國際合作「歐盟奈米材料研究計畫」徵求公告

一、目的：為提升跨領域之奈米材料科技整合及國際能見度，104 年公開徵求國際合作歐盟奈米材料研究計畫，期能建立跨國研究案合作關係及溝通平台，提升我國奈米科技研發能量。

二、申請機構。

- (一) 公私立大專校院、公立研究機構。
- (二) 經科技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、申請對象：計畫主持人需符合「科技部補助專題研究計畫作業要點」者。

四、申請計畫重點說明

本次徵求之六項重點如下，詳細請見 <http://www.m-era.net/joint-call-2014>。

## (一) 材料整合計算工程 (Integrated Computational Materials Engineering)

### 1. 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 processability. 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 (compositionally defined) materials with target properties, OR
- b) Tailoring microstructural changes of known materials (e.g., during processing) to obtain improved properties.

The proposals should address each of the following items:

#### 1) Constitutive modelling and computational simulation:

Use of materials physics-based design principles in a computational environment

#### 2) Target properties:

Specification of materials properties to be reached

#### 3) Experimental validation:

- a. in case of scheme a): Validation of the predicted properties at appropriate length scales, based on the model constituents.
- b. in case of scheme b): Validation of the expected performance in manufacturing and processing.

The proposals should clearly present the approach taken for coupling these items.

## **2. Expected impact**

- ◆ Improved predictive power of Integrated Computational Materials Engineering.
- ◆ Establishment of well-targeted materials design and processing concepts.
- ◆ Building and strengthening a common European research community in the area of Integrated Computational Materials Engineering.
- ◆ Increased competitiveness of the European industry by cost saving in materials design and processing and a shortened time-to-market for new materials with advanced properties.

The proposal should address how it will contribute to the expected impact of the topic.

## **3. Target groups**

This topic is targeted to two steps in the innovation chain: basic research and applied research. Project consortia focusing only on basic research or only on applied research are also eligible. The establishment of a strong collaboration between research entities and further networking is strongly encouraged.

## **(二) 新型表層塗料與鍍膜技術 (New Surfaces and Coatings)**

### **1. Technical content/scope**

Europe is still keeping an outstanding position in surface and coating technology that is a key technology entangled in numerous industrial sectors. In this call typical technical application areas that are addressed are tribology, chemical and corrosion resistance and multifunctional properties, such as optical, electromagnetic, (anti-) adhesive, electro catalytic characteristics.

The objective is to develop new or significantly improved coatings, interfaces and process solutions for chemical and/or physical surface modification acting at the level of the materials surface. This call aims to generate new insights in surface modification and tailoring of (multi-) functional coatings. This will enable a new generation of materials with improved and diverse characteristics.

The project proposals should address new surface modification and coating solutions, consider new processing routes or new concepts for coating and surface treatment. Project proposals should also focus on interdisciplinary process combinations, new surfaces and coating materials, material compounds, graphene related materials, nanomaterials or multilayers. Consideration should be given to basic understanding of the mechanisms,

experimental assessment, prototyping, up-scaling, manufacturing and/or validation. The proposals should 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. In order to ensure relevance for different partners in the value chain the proposal should state clear concepts for application(s) and sector(s).

## **2. Expected impact**

- ♦ New and improved components/products with tailored properties or functionalities by tuned surfaces and coatings.
- ♦ The focus has to be laid on a clear ecological impact in terms of avoidance of hazardous materials and compounds and aspects of sustainability in processes, coating material and technology and life time cycles.
- ♦ The project should include partners all throughout the value chain, even proposals focused on basic research should give a strategy for transfer to industry including a roadmap of valorisation.
- ♦ The project should emphasize on new products by functionalised surfaces and coatings that might have strong societal impact, on e.g. safety, economics and life quality. These are expected to create synergies between industry and research.
- ♦ The transnational and/or international exchange of researchers from RTD entities and industrial partners is encouraged.
- ♦ This call is not aimed at surfaces and interfaces related to sensors.

## **3. Target groups**

This topic is targeted to all groups in the innovation chain: basic research, applied research, industrial R&D and production. The particular subject of the proposal deals with the establishment of a strong collaboration between research entities and SMEs.

Interdisciplinary projects are encouraged and should enable a broader cross-sectorial use. Participation of large industry is encouraged e.g. as potential end user of the technology proposed.

## **(三) 複合材料技術 (Composite Technology)**

### **1. Technical content/scope**

Composites within the scope of this call are referred to as engineered materials composed of two or more constituents – typically a polymer matrix and a reinforcement being in the form of a fibre or a filler - to meet the requirements which cannot be otherwise fulfilled by one component alone.

The call is not limited to the structural composites having outstanding mechanical

performance with high strength or stiffness to weight ratio but also targets enhancements in physical/chemical properties such as electrical, optical or magnetic properties. The research proposals could also address methodology and tools for design-optimisation, manufacturing, automation, process and structural health monitoring, and modelling and simulation of processing as well as in-service behaviour of composites.

The possible application areas of composites may include among others light weight structures in transportation and mobility, in energy and other engineering applications.

The research proposals should address one or more of the following:

- ♦ New material designs based on defined structure/property relationships, enabling drastic improvement of the mechanical performance.
- ♦ New composites which combine improved mechanical performance with other physical or physical-chemical functionalities like enhanced thermal, electrical, magnetic, chemical properties, and self-healing abilities. This could be achieved among others by the integration of nano phases into the composite.
- ♦ Composite processing methods enabling high production rates, aiming at applications in high-volume markets; material innovations could encompass fast curing, low viscosity resins or stampable thermoplastic composite sheets, but also automation, robotisation and energy optimisation of the production process should be envisaged.
- ♦ Composite processing technologies for joining, assembling and repair, which also reduce after-work.
- ♦ Composites with low ecological impact such as those composed of biobased polymer matrices and/or natural fibres
- ♦ Modelling and simulation of processing conditions and in service behaviour of composites using a multiscale approach.
- ♦ Novel and unique knowledge in molecular design, functionalization and characterization of a wide range of fibre or filler reinforced composite materials.
- ♦ Composites which include graphene related materials

To strengthen the whole innovation chain it is strongly recommended that the project proposal should be balanced by incorporating 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. International cooperation is strongly encouraged.

## **2. Expected impact**

- ♦ More competitive industrial products and processes using the advanced materials design and manufacturing concepts supported by modelling and simulation tools.

- ◆ Socio-ecological benefits provided by products with higher integration level of functionality, lighter products to transport, lighter vehicles to decrease energy consumption, and by using materials with 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 result in networks inside Europe, thereby improving the sharing of knowledge and reinforcing both technological and scientific platforms.

### **3. Target groups**

This topic is targeted to all groups in the innovation chain: basic research, applied research, industrial R&D. The particular subject of the proposal deals with the establishment of a strong collaboration between research entities, SMEs and large industry.

## **(四) 可持續和可負擔的低碳能源材料 (Materials for Sustainable and Affordable Low Carbon Energy Technologies)**

### **1. Technical content/scope**

The sector of advanced materials for energy is an important economic and employment generator in Europe. Sustained innovation by research and development projects will reinforce its economic value.

New and advanced materials are essential to achieving the goals of a low carbon economy. Materials are an integral part of the solution for addressing the Energy and Climate Change Challenges. Currently over 80 % of Europe's energy use is based on oil, gas and coal. The European Strategic Energy Technology Plan (SET Plan)<sup>1</sup> 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.

The scope of this call is to develop advanced materials or material systems with improved physical, chemical and mechanical properties leading to advances on the following topics:

- 1) Materials for energy efficient buildings and industrial processes (for example: advanced insulation materials...)
- 2) Energy efficiency by reducing consumption (for example: materials for high efficiency / high brightness lighting (LEDs / OLEDs), materials for high power electronics in converters...)

---

<sup>1</sup> [http://ec.europa.eu/energy/technology/set\\_plan/set\\_plan\\_en.htm](http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm)

- 3) Solar energy generation (for example: materials for photovoltaics and concentrated photovoltaics)
- 4) Mechanical energy generation (for example: materials for wind energy, ocean energy...)
- 5) Other energy generation (for example: materials for thermoelectric energy, fuel cells, geothermal energy...)
- 6) Energy storage (for example: materials for electro-chemical energy storage, chemical energy storage, “solar” fuels, mechanical energy storage, molten salts...)

The research proposals should give sufficient attention to mid- or long term industrial feasibility, reliability, durability and full life cycle analysis (LCA). The materials development should aim to a future decrease in cost of energy, combined with lower carbon emissions.

A proposal must also consider, demonstrate and clarify its added value and impact, and where appropriate, its alignment with the SET Plan materials Roadmap. The proposal has to position itself on the Technology Readiness Level (TRL, see Annex 2 of Guide for Proposers) scale with clear start and envisioned end point as well as a potential roadmap towards an existing or future end-market.

For basic research programmes (lower TRL), the establishment of an industrial advisory board is highly recommended to ensure the relevance of the research. For higher TRL, integration of industrial partners who manufacture or use the advanced material is strongly recommended.

In case the research proposal intends to make use of critical and potentially scarce raw materials – see critical raw materials for EU<sup>2</sup> - the applicants are requested to present a justification for this choice. Projects may also address substitution or recycling of such critical or scarce materials.

## **2. Expected impact**

- ◆ Support to meet the European strategic policy targets in terms of CO<sub>2</sub> reduction and developing affordable sustainable energy usage.
- ◆ Improved competitiveness and strengthened industrial leadership.
- ◆ Innovation excellence of the European academia and research institutes.

---

<sup>2</sup> [http://ec.europa.eu/enterprise/policies/raw-materials/critical/index\\_en.htm](http://ec.europa.eu/enterprise/policies/raw-materials/critical/index_en.htm)

### **3. Target groups**

This topic is targeted to all groups in the innovation chain: fundamental research, applied research, industrial R&D. The particular subject of the proposal deals with the establishment of a strong collaboration between research entities, SMEs and large industry. Consortia focusing only on fundamental research or industrial R&D are also eligible.

## **(五) 健康及衛生材料 (Materials for Health)**

### **1. Technical content/scope**

Wellness and healthy ageing of the European population will require new or improved solutions to health-related issues. Many of those solutions will come from the development of new advanced materials as key components of diagnostics (contrast agents, substrates for immunoassays, sensors) and therapeutics products (implants, tissue regeneration strategies, advanced therapies, etc.).

The objective of this call topic is to provide opportunities to advance application-driven, material-based technologies closer to the market. This action is aligned with societal challenge 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.

Following the strategy laid out in the M-ERA-NET work programme 2013, the proposals expected within the 2014 call should address development, improvement or functionalization of materials and/or materials based micro-nano devices for *in vivo* applications in the following two areas:

- ◆ Contrast agent materials for medical imaging
- ◆ Materials for tissue regeneration and/or advanced cell therapies.

The proposals should address the following:

- ◆ Biocompatibility studies for novel or chemically modified materials should be included in the proposal. In particular, interaction of materials with appropriate body tissues or fluids should be considered where applicable, as well as absorption, distribution, excretion and metabolism studies.
- ◆ The market potential for the proposed technical solutions should be evaluated.
- ◆ Adequate resources should be provisioned to deal with the relevant regulatory hurdles during the course of the project.
- ◆ Where relevant, adequate consideration should be given to the future scaling-up of the proposed processes and to the possible industrialization of a final product.

- Efforts should also be made to position the project's starting and estimate the expected end points on the Technology Readiness Level (TRL) scale as well as an estimation of the time needed to reach the market (see Annex 2).

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

- Pre-clinical proof of concept (*in vitro* testing and/or assays in small animals)
- Cross collaboration between biologists, medical doctors and materials scientists
- Involvement of SMEs and/or industrial partners
- International collaborations with leading research entities from M-ERA.NET-associated countries

## **2. Expected impact**

- Production of new or improved materials for health that deliver enhanced performance and/or enhanced cost/benefit ratio.
- Improved competitiveness of the European Health industry through a clear increase of the Technology Readiness Level for the proposed technologies.
- Improved market access through increased awareness on the part of the RTD performers and industrial partners of the regulatory protocols that must be followed before their materials reach the patients.
- Generation of a robust dialogue between RTD performers and industrial and medical stakeholders of the Health Sector.

## **3. Target group**

This topic is targeted to all groups in the innovation chain: fundamental research, applied research, industrial R&D. Collaboration between research entities, SMEs and large industry is encouraged.

## **(六) 利用於感測器之功能性材料(Functional Materials Focusing on Sensors)**

### **1. Technical content and scope**

Overall improvement of human and environmental well-being can be increased by intelligent and user friendly solutions of sensing devices. Chemical or physical sensors can cover various applications areas related to transport, well-being, entertainment, health, environment, security and safety. Europe as a knowledge based economy has to keep its worldwide position in this field. On one hand there is a need for fundamental understanding of mechanisms and processes from a materials point of view. On the other hand there are already many materials tested in a laboratory environment that need to find their way in the application domain.

The projects should address functional materials for chemical or physical sensors. The call

is open for all types of materials and application areas. Biosensors<sup>3</sup> are excluded from the scope of this call.

The research proposals should focus on either one of the following types of activities:

- a. Fundamental understanding: Improve the fundamental understanding of the interactions and sensing mechanisms from a materials perspective. These projects can aim for an improved understanding of existing materials or new structures of existing materials or they can aim for the development of completely new materials and the understanding of their sensing mechanisms. Activities include but are not limited to modelling and simulation.
- b. Transfer to application: Transfer of materials that have already been tested in a laboratory environment into real world applications. The proposal should contain a clear set of preferably quantitative specifications that are required for a successful implementation in the envisaged application.

All proposals should clearly indicate in which project type they are positioned and at what level on the Technology Readiness Level (TRL) scale the project is situated (see Annex 2).

## **2. Expected impact**

The expected impact depends on the type of project:

- a. The fundamental understanding of sensing mechanisms of materials will enable a faster design and development of new generations of sensors. These projects will not have a short-term implementation but should boost the knowledge that is needed for new developments on the longer term.
- b. The application-focused proposals should have a clear market perspective and should contain a quantitative description of the market potential.

## **Target groups**

This topic is open for all actors in the innovation landscape and collaboration between different types of actors is encouraged. The projects dealing with fundamental understanding will likely be driven by universities and research centres, although industrial applicants are certainly not excluded. Besides, for consortia consisting only of basic research actors, the establishment of an industrial advisory board is highly recommended to ensure the relevance of the research. The application-driven projects require a strong involvement of industry to ensure a successful implementation.

---

<sup>3</sup> According to the IUPAC definition for a biosensor: A device that uses specific biochemical reactions mediated by isolated enzymes, immuno systems, tissues, organelles or whole cells to detect chemical compounds usually by electrical, thermal or optical signals.

(Reference :<http://goldbook.iupac.org/B00663.html>).

## 五、申請方式

- 1) 請依附件 pre-propsoal 格式完成構想申請書，於 **2014 年 09 月 16 日前(布魯塞爾時間 Brussels Time 12:00PM 前)**以 Email 方式寄至科技部自然司王心頎小姐收 (email: [soa145@nsc.gov.tw](mailto:soa145@nsc.gov.tw))。並完成上傳 Pre-proposal 至 M-ERA.NET (<http://www.m-era.net>)。
- 2) 申請團隊中，包含申請人至少需有二個國家的參與及三個團隊的組成。奈米國家型科技計畫辦公室亦可協助申請人於歐盟計畫平台上徵求國外對應合作對象，請申請人將計畫構想摘要、欲合作項目及對象與聯絡方式交給奈米國家型科技計畫辦公室聯絡人轉交。計畫執行期限以三年為原則。
- 3) Pre-proposal 中本國之子計畫將由科技部依 M-ERA.NET 規定初審。歐盟暫定在 2014 年 12 月至 2015 年 1 月公佈 Pre-proposal 的審查結果，並通知申請人於 2015 年 2 月 18 日前上傳 Full proposal，申請人需同時將 Full proposal 以 Email 方式寄至本部自然司王心頎小姐收 (soa145@nsc.gov.tw)。
- 4) Full proposal 由 M-ERA.NET 依歐盟標準進行審查。歐盟暫定在 2015 年 5 月公佈 Full proposal 審查結果。歐盟公告 Full proposal 通過名單後，通過之申請人需將完整計畫書及所分配工作項目，循本部 104 年度專題研究計畫線上申請計畫方式向本部正式提出申請，並依指定日期前造具申請名冊備函送達本部\*。本部將依據歐盟通過計畫書之工作項目核定適當經費，額度以每件計畫每年 300 萬元為上限。（\*公文送達日期請待本部承辦人另通知。）
- 5) 本類計畫屬於研究案，經本部核定通過後將計算件數。
- 6) 本計畫無申覆機制。
- 7) 聯絡人：  
奈米國家型計畫辦公室 王媧鈞小姐(email: [andrewang@nctu.edu.tw](mailto:andrewang@nctu.edu.tw))，電話 03-5165727；  
科技部科國司 陳禹銘博士(email: [ymchen@most.gov.tw](mailto:ymchen@most.gov.tw))，電話 02-27377959；  
科技部自然司 王心頎小姐(email: [soa145@most.gov.tw](mailto:soa145@most.gov.tw))，電話 02-27377022。

六、通過核定後之計畫，請依本部相關規定繳交研究成果及結案報告等，及每半年提供一次計畫執行成效。必要時，得請計畫主持人至本部指定場所口頭報告，或配合本部辦理實地考評審查。

七、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。

八、相同研究計畫內容，不得重複向科技部或本國其他機構申請。