25 July 2019

Invitation for the Expressions of Interest to join the Graphene Flagship Core 3 project

Introduction

The Graphene Flagship's mission is to take graphene, related layered materials and hybrid systems (GRMs) from a state of raw potential to a point where they can revolutionize multiple industries. This may bring a new dimension to future technology and put Europe at the heart of the process, with a manifold return on the investment as technological innovation, economic exploitation and societal benefits.

This requires the focus of the Flagship to evolve over the years, placing more resources in areas where this transition is more likely. To accomplish this, we are looking for new partners that bring in specific industrial and technology transfer competences or capabilities that complement the present consortium. The specific area of interest and the required capabilities are listed below.

The selected new partner will be incorporated in SH10 GICE, one of the spearhead projects of the third Core Project under the Horizon 2020 phase of the Flagship that will run during 1 April 2020 – 31 March 2023. The new partner will be requested to sign the relevant agreement with the EC – the Framework Partnership Agreement - as well as the Consortium Agreement that regulates the relations between the partners in the consortium.

The addition of the new partner to the Graphene Flagship consortium is subject to the approval of the required contract amendment by the Graphene Flagship General Assembly and, at a later stage, the European Commission (EC).

Submission deadline is **30 August 2019, 12:01 p.m. - noon CEST** (Brussels time).

Indicative budget (EC financing) for the period 1 April 2020–31 March 2023: **350 000 €**

Expressions of Interest must be submitted by e-mail to graphene-eu@esf.org

Contact for admin questions: graphene-eu@esf.org

Contact for technical questions: Elmar Bonaccurso (elmar.bonaccurso@airbus.com); Carlo Iorio (ciorio@ulb.ac.be)

Eligibility

In order to be eligible, an Expression of Interest (EoI) must:

- Be submitted by e-mail to graphene-eu@esf.org and before the deadline.
- Follow the EoI application template, including all contents specified under the section “Format of Applications”
- Comply with the eligibility conditions set out in the Rules for Participation Regulation No 1290/2013, in the call Graphene FET Flagship call project included in the Horizon 2020 Work Programme 2018-2020 Future and Emerging Technologies, and in the call FETFLAG 1 – 2014 included in the Horizon 2020 Work Programme 2014-2015 Future and Emerging Technologies.

Format of Applications

Each EoI application is limited to up to five A4 Pages and must describe how the organisation meets the specific competence and capability requirements in the topic that it addresses.

It must include a description of the organization in general and the unit relevant to the specific call for EoI, including name(s) and contact information of the principal investigator(s), as well as resource environment as a whole (e.g., participation in relevant national or international projects) and requested budget.

Applications should be typed in single line spacing, font Arial, pt11, page margins 2cm (top, bottom and side). Figures, schemes and tables may be included within the given page limit. All references should appear at the end of the document and do not count towards the page limit.

The EoI application template is available here:

https://graphene-flagship.eu/SiteCollectionDocuments/EoI_Application_Template_2019_GICE.docx

The application should be named as “EoIReference Organisation of the applicant” (e.g. EoISH10 Company) and must be submitted as a single .pdf file by e-mail to graphene-eu@esf.org and before the deadline specified above.

Applications submitted in a different way and/or after the deadline will not be admissible.

For administrative questions, please contact graphene-eu@esf.org, for technical questions, the contact information is given in the introduction.

Selection Criteria and Evaluation

The evaluation will assess each EoI based on technological competence and impact on the specific needs in the addressed topic and how they complement the existing consortium.

A crucial requirement in the EoI is to demonstrate a genuine commitment at the highest levels towards GRM technology. This for example can be shown as a solid track record of work in the area with specific products, demonstrators or prototypes already achieved, or by the existence of a team with sufficient funding and know how, already working on GRMs. The level of funding provided by the Flagship will not be enough to create a new activity on GRMs in an environment that does not have one already. It is meant to align work already ongoing with the overall aims of the Flagship and to enable the organizations to transfer specific know how not available in the present consortium, while at the same time providing them access to the world leading competencies already present in the Flagship.

The selection will be made by the Graphene Flagship Executive Board.

EoI Topic Description

Topic description: Graphene based heater mat for electrothermal ice protection system

EoI Identifier: EoI-SH10

Spearhead project: SH10 - GICE

Description of competences and capabilities sought:

Next generation aircraft components, such as wings, rudder, rotor blades, air inlets, antennae, windshield require easy to integrate and flexible ice protection technologies. The objective is to mature graphene technologies for ice protection and detection and to demonstrate their integration in aircraft components.

We look for a partner who has achieved all the following required items at the time of application:

1) 10kg/month GRM production: Sustainable production of GRMs on the scale of 10 kg/month (following ISO/TS 80004-13:2017(en) material specifications for graphene flakes). The production process must be in operation commercially.
2) Spray deposition or brush painting of GRM: GRM-based ink formulations suitable for spray deposition (preferred) or brush painting (acceptable) of coatings under standard paint shop conditions, with good adhesion on different substrates (polymers, carbon and glass fibre composites, metals);

3) >10kW/m² heating power density for an applied voltage of for applied voltage up to 230V AC, 3-phase, or 540V DC (+/-270V) for GRM-based coating
4) Electrical contacts: Expertise in fabricating electrical connectors (using tin based solder or similar technology) to GRM-based coatings (expertise demonstrated via publications or patents or products)
5) Experience in heating applications and aerospace components: Demonstrated capability of integrating GRM-based heating coatings in representative aerospace components.

The target of the project is to develop a de-icing heater for aerospace. To be included in the response to the EOI, but to be achieved by the end of Core 3:

1) The targeted range of heat power densities in the final product is 20-50 kW/m2. A detailed plan to reach such heating power density should be described, for applied voltage up to 230V AC, 3-phase, or 540V DC (+/-270V)
2) A plan should be described to commercialize the product.
3) A plan should be provided to show future GRM production at 1-10 tonnes/year.

The response to the EoI should also include: demonstrated technology readiness; concept and processes proven at laboratory scale, table-top experiments; potential of materials and up scaling issues identified; benefits vs state-of-the-art assessed; any additional information supporting maturity demonstration could be provided.

The response to the EoI should also state a clear roadmap to reach, at the end of the project, TRL5 for the specific technology “Graphene-based thermoelectric heatable coatings”. TRL5 requires the technology to be integrated into the targeted product, with reasonably realistic supporting evidences, so that the integrated technology can be tested in a simulated environment (icing wind tunnel tests, electrical test bench…). The plan or feasibility assessment shall be also provided to upscale the GRM production rate, to ensure reaching large scale material delivery (at the level of 1 to 10 tonnes/year) sufficient to cover the GRM needs of a large aerospace company.

Description of the Graphene Flagship Core 3 spearhead project where the selected applicant will be integrated:

SH 10 GICE Thermoelectric ice protection systems (IPS) play a major role in next generation aeronautical products:

- Bleed-air-based IPS have a number of drawbacks, among which the incompatibility with polymer/composite structural components due to too high temperature of the air

- Current thermoelectric IPS may suffer limitations to adapt to power density requirements or for integration into complex 3D-shaped components
- For next-gen aircraft (A/C) components like wings, rudder, rotor blades, air inlets, antennae, windshield, new easy to integrate and flexible ice protection technologies are urgently needed; flexible relates to the ability to adapt to the requirements in terms of geometry, generated power density, and available on-board voltage supply
- Environmental aspects (lower power consumption & emissions –CO2/NOx) are a key driver

Based on the work performed by various partners of the Graphene Flagship during the Core 1/2 phases with the development of graphene-based IPS at low TRL, the goal in SH 10 GICE is to advance these technologies to higher maturity (TRL6) and to develop three technology demonstrators for specific use cases needed by the industrial partners, mainly Airbus and Sonaca. Airbus is the largest European aerospace original equipment manufacturer (OEM) and Sonaca is a strategic Tier-1 supplier of components for Airbus, but also for other European and international aerospace OEMs.

The selected demonstrators are components that must be protected during flight in icing conditions:

• A large slat for single aisle A/C

• A rotor blade for helicopters (H/C)

• A ventilation scoop air inlet

These three demonstrators will have an integrated graphene-based IPS and a graphene-bases ice detection sensor –all technologies derived from previous activities in Core 1/2. The GICE partners will test features of the demonstrators in operational environment in icing wind tunnel tests (IWTT), assess their operability (reparability, maintainability, replacement), but foremost demonstrate the industrialization of the manufacturing process –which is the most demanding step towards industrial maturation of the technology.

The partners cover all strategic positions of the whole value and supply chain), from material development & production, to functional element manufacturing, to integration in composite elements, to integration of these “semi-finished” sub-components (or technology bricks) into final components, to quality assessment of sub-components, to integration into the final product, to finally obtain the required type certifications from the transport agencies (European Aviation Safety Agency -EASA -and the Federal Aviation Administration -FAA).