Materials Substitution for Safety, Security and Sustainability

Call type: Expression of interest
Closing date: 16:00 2 May 2013

Related themes: Manufacturing the Future, Engineering, Physical Sciences

Summary
EPSRC would like invite Expressions of Interest to bid into the call for research proposals in Materials Substitution for Safety, Security and Sustainability. The aim of the call is to support research that addresses the manufacturing challenges associated with novel replacements for materials that are scarce, difficult to source, expensive or deleterious to health and the environment.

EPSRC wishes to build capability in a small number of promising materials opportunity areas. EPSRC expects to support up to five large, long term multidisciplinary programmes and will provide up to £10M for this call. Proposals are expected to outline an ambitious programme of research.

Successful materials innovation is likely to require a multidisciplinary approach in order to address the materials, manufacturing and systems issues. Materials substitution can be disruptive and may require new business models. The involvement and input of companies and other users is particularly important in order to increase the likelihood of successful adoption.

Together these activities will enable the UK to meet difficult environmental and social challenges and to create wealth through the discovery, development and deployment of improved materials, processes and products.

Background
Materials replacement provides the backdrop to our human history and civilisation. Human eras are often defined by the materials technologies prevalent at the time – for example the transitions from the stone, through bronze and then iron ages. Within each era new production technologies were able to produce artefacts with enhanced performance, which then heralded whole classes of new products and tools. The impact on societies of these material innovations was often profound, indeed transformative.

Materials substitution has also been driven by other forces. For example, the timber frame construction associated with Tudor age buildings disappeared relatively quickly – largely because of the competing demand for constructional timber from shipbuilding and increased scarcity and cost following deforestation. Materials scarcity and security is not a new phenomenon.
In modern times, advanced structural composites and light alloys have slowly displaced structural steels in many transport and vehicle applications. Lightweight materials allow greater fuel efficiency and reduce whole life cost, but adoption by companies has depended on progress on manufacturability, service reliability and cost.

The dynamic between product performance, economic factors (e.g. production, system and whole life costs) and manufacturability has therefore been critical to adoption of new materials technologies – and this trend is expected to continue into the future.

Materials substitution is always an important factor for innovation and industrial development. However, there are a number of specific drivers which make this particularly timely and important. Industry is seeking similar or replacement materials in the manufacture of goods for a number of reasons:

- Material usage being restricted based on its threat to human health and safety, where future regulation (e.g. REACH Regulations) will mean that businesses need to consider alternative approaches

- Reaching the limits of key non-renewable materials (e.g. phosphorus, indium, lithium and rare earths), such as those found in high-tech, defence and green technologies, which can be vital for economic growth

- Increasingly manufacturers are expected to take a whole life perspective, with a growing stewardship role, particularly at the end of life of products (e.g. WEEE Regulations). Material usage should not only not pollute or unnecessarily contribute to the waste stream, but also needs to take account of the future waste/materials system.

Whatever the driver, the resultant need is for new, replacement materials that can be used by industry in the manufacture of goods.

While the principle may be simple, material substitution is not straightforward, as users are not able to switch from one material to another without having to overcome barriers. Many of the barriers to the uptake of new materials centre on the processing of those materials. Research is needed to understand how to incorporate new materials into existing processes, or to adapt existing processes to account for the characteristics of a new material. In extreme cases adopting new materials could significantly disrupt existing supply chains.

The UK has strong research communities in materials science, engineering and manufacturing, encompassing but not limited to: advanced composites, low energy electronics (including metamaterials), materials for energy (including nuclear), high performance alloys and nanomaterials. EPSRC has supported critical mass activities in these areas over a number of years including Interdisciplinary Research Centres, Programme Grants, EPSRC Centres for Innovative Manufacturing, Energy and Resource Efficiency Centres, etc. In addition the Technology Strategy Board has become active in materials innovation and has recently established a number of Catapult Centres, including the High Value Manufacturing Catapult. The EU Framework and now Horizon 2020 Programme also support a range of activities relevant to this area.

This new initiative seeks to integrate UK strengths across the research landscape, to accelerate the pathway from materials innovation through manufacturing.
Strategic context

The scope of this call aligns with the BIS Industrial Strategy by providing support for the Advanced Materials proposition, using materials innovation and advanced manufacturing to:

- Reduce lead times to market, by researching new processing methods to manufacture alternative materials
- Focus on materials sustainability, protecting sovereign capability and security of supply for future prosperity, as well as helping society deal with the challenges of energy supply and protection of the environment
- Develop market opportunities for new materials, by addressing the optimisation and scale up issues for their manufacture.

EPSRC will shortly announce a “Capital for Great Technologies” call for capital requests, one of the themes of which will be capital for advanced materials. Although the scope of both calls covers materials research, the calls will be run as separate peer review processes. Full submissions to either call should be written as stand-alone proposals, and not rely on a proposal to the other call being funded for their success. EoI submissions to this call may make reference to any institutional submission to the capital requests call; however this is no guarantee of the EoI being considered further.

The Technology Strategy Board is currently running a competition in ‘Materials Innovation for a Sustainable Economy’. This EPSRC call is related to the Technology Strategy Board competition, however it focuses on opportunities for radically new approaches, as opposed to the demonstration and adoption of known alternative materials. The Technology Strategy Board is nonetheless engaged in this call ensuring the activities are complementary.

This call also aligns with the RCUK Research Challenge in Manufacturing: from atoms to aeroplanes, by supporting research into innovative production technologies in materials, manufacturing and materials processing.

Scope of Call

The objectives of this call are to:

- Increase UK research capacity in materials substitution within a manufacturing context: strong, multidisciplinary research teams supported by world class research infrastructure engaged in long term collaboration with industry
- Promote networking and collaboration across relevant disciplines and with industry
- Provide a focus for research into the deployment of new materials into manufacturing supply chains.

This call will support research into the processing and production technologies needed to accelerate the adoption of new materials and material systems by manufacturing industries. This includes issues such as materials specification and performance, processing and production scale up, design, product integration (e.g. assembly and joining), sustainability, cost and market development.
This call will not cover:

- Industrial development & deployment of substitute materials (at TRL >3), as this would fall under the remit of the Technology Strategy Board
- Research primarily into the material use reduction, reuse and recycling aspects of resource efficiency
- Research primarily into the synthesis and characterisation of novel materials.

The call has no predetermined preferences in relation to specific materials types or particular replacements. It is open to opportunities which address either structural or functional material applications.

**Research programmes**

We would expect successful research consortia to:

- Conduct a programme of innovative research that is focused on promising new opportunities for manufacturing using alternative materials
- Seek to understand the potential pathway to manufacture, including the development of novel production processes for replacement materials and how these might scale-up
- Adopt a systems approach both in terms of the manufacturing value chain and resource system, and give particular consideration to energy, material supply, industrial and economic issues which might affect the adoption of alternative material
- Be multidisciplinary and where appropriate cross-sectorial, as materials may well find more than one application
- Develop a suite of people-based activities to help strengthen the essential cross-disciplinary collaborations, develop new research activities and increase impact in this area
- Draw upon emerging materials science capability in the physical sciences, including research into materials discovery, characterisation, synthesis and growth supported by EPSRC Physical Sciences theme
- Have strong alignment with industry needs and a strategy for engaging with companies and other potential users of the research
- Give consideration to downstream commercialisation, including the barriers to adoption by business, potential impact on business models and the UK supply chain, where economic and social science researchers may make a useful contribution
- Have a strategy for the progression of successful research beyond EPSRC funding, including direct partnership with industry, involvement in TSB programmes and collaboration with the High Value Manufacturing Catapult Centres.
**Funding available**

EPSRC are committing up to £10M for this call to support research programmes of up to five years with flexible funding (similar to that provided through EPSRC platform and programme grants) that can be used for a mixture of multidisciplinary research projects, feasibility studies and networking and outreach activities.

Research programmes should range between £2M - £3M and consist of a suite of related activities built around a central research challenge, based on existing application areas.

The funding should also allow the flexibility to explore speculative application areas and to change direction during the grant to explore these new opportunities as they arise.

Programmes should include a management structure from the outset to ensure that a clear decision-making process is in place to manage any change of direction (as well as retain the objectives of the research as assessed throughout the lifetime of the grant).

Programmes are encouraged to request resources to include the creativity@home initiative. Guidance on this initiative is included later in this document.

Multi-institutional bids are welcome, although a single Je-S form only may be submitted if a full proposal is invited.

**Equipment**

Where possible, researchers are asked to make use of existing facilities and equipment, including those hosted at other universities. If equipment is needed as part of the research proposal, applicants must follow EPSRC’s rules for requesting equipment over £10,000 in value. Individual items of equipment up to the current OJEU (Official Journal of the European Union) procurement threshold can be included on research proposals submitted through this call, but research organisations will be expected to make a contribution to the cost. All requests for single items of equipment above the current OJEU threshold will need to go through a separate process which will assess the strategic need for the equipment and how to ensure maximum usage. These proposals will be assessed through the separate Strategic Equipment peer review process.

As mentioned above, EPSRC will shortly announce a “Capital for Great Technologies” call for institutional capital requests. Although the calls will be run as separate peer review processes, EoI submissions to this call may make reference to any institutional submission to the capital requests call. However this is no guarantee of the EoI being considered further. The outcome of the capital request call should be known before the full proposal submission date for this call.

Items of equipment for instrument development will not need to be co-funded by another partner or go through the strategic equipment process. Equipment for instrument development should be integral to a research proposal.
For more information on equipment funding, please see:
http://www.epsrc.ac.uk/ourportfolio/themes/researchinfrastructure/subthemes/equipment/Pages/default.aspx

Eligibility
For information on the eligibility of organisations and individuals to receive EPSRC funding, see the EPSRC Funding Guide:
http://www.epsrc.ac.uk/funding/appprev/fundingguide/Pages/fundingguide.aspx.

As this call is a targeted funding opportunity provided by EPSRC, higher education institutions, and some research council institutes and independent research organisations are eligible to apply. A list of eligible organisations to apply to EPSRC is provided at:
http://www.rcuk.ac.uk/research/Pages/Eligibilityforrcs.aspx

How to apply

Submitting application
Applicants should complete the Expression of Interest (EoI) form in the first instance. At this stage, we will not accept any other documents such as annexes, a work plan or letters of support. Please fill in the attached EoI form and send it by email to: MatSubCall@epsrc.ac.uk by 16:00 on 2 May 2013.

Assessment

Assessment process
There are two stages in the assessment process. These are described below, with the relevant assessment criteria in the following section.

Stage 1: Expression of Interest (EoI)
The first stage consists of submitting a short form that provides an overview of the research being proposed. The four-page EoI contains the following sections:

- Applicants
- Research vision
- Proposed programme of research activities
- Resources required.

An EPSRC panel with independent academic and industry representation will short-list the EoIs against the assessment criteria based on the information contained in the EoI form.
Shortlisted EoIs will then be invited to submit a full grant proposal, subject to any specific advice that the panel may give to better align the proposed research to the scope of the call.

We reserve the right to reject proposals that are substantially outside the scope of the call or wholly beyond the remit of EPSRC without reference to peer review.

**Stage 2: Full proposals**

After short-listing the Expressions of Interest, we will invite a number of applicants to prepare and submit full proposals using the Research Councils’ Joint electronic Submission (Je-S) System (https://je-s.rcuk.ac.uk/). We will send further details on this process with the invitations to submit full proposals.

Please note that EPSRC reserves the right to reject a full proposal where the resources are substantially different from those indicated in the EoI form or where there have been other significant changes from the EoI.

Both single and multi-institutional bids will be welcome; however, proposals must be submitted on one common Je-S proposal form even if they are multi-institutional bids.

The full proposal should follow the standard EPSRC proposal structure (http://www.epsrc.ac.uk/funding/apprev/preparing/Pages/writing.aspx). The full research proposal should expand on the research challenge and proposed work programme as summarised in the EoI, and also should include:

- Track record of the applicants, justification of the added value offered by the assembled collaborative team and how this grant will complement the group’s other activities
- Full details of the involvement of project partners where appropriate, including their contributions and role in transfer of research outputs. Statements of support should be included as appropriate
- A strategy for identifying and engaging with potential users and steps that will be taken to ensure that the outputs of the research and made available to potential users and suitable metrics for determining the success of the strategy in delivering value to users and the UK
- Statement of national importance
- Statement of pathways to impact
- Detailed arrangements for project management in terms of milestones and deliverables.

Full proposals will be sent to independent peer reviewers, including at least one nominated by the applicant. The peer reviewers’ role will be to provide comments on the proposal against the full proposal assessment criteria. Those proposals with sufficiently favourable reviewers’ comments will be invited to respond to the reviewers’ comments and then be assessed at an interview panel.

This interview panel will include independent assessors from both industry and academia, as well as observers from EPSRC. The interview panel will rank the proposals against the full assessment criteria, using the reviewer comments,
applicant’s response and overall interview performance. The panel will be asked to make funding recommendations to EPSRC.

**Assessment criteria**

**EoI assessment criteria**

The EoI will be assessed on the following assessment criteria:

- Fit to the scope of the call (as described in this document)
- Vision for the proposed research to deliver solutions to the research challenge and intended outputs and deliverables
- Appropriateness of the research team(s)
- Management structures – a brief outline of management arrangements is required. A project plan is not required at this stage.

**Full proposal assessment criteria**

In addition to ensuring that the programme of proposed research fits within the scope of the call and addresses any recommendations made by the panel (based on the EoI submission), full proposals will be assessed on:

- Quality of the proposed research including novelty, timeliness, ambition and appropriateness of the proposed methodology
- National Importance and how the research underpins or contributes to manufacturing challenges and emerging industries
- The pathway to impact and effectiveness of the activities identified to help realise these impacts, including the resources requested for this purpose. This includes the pathway to manufacture
- Applicant ability to deliver the research, effectively operate any equipment requested and the balance of skills within the research team
- Appropriateness of resources requested and management plans.
- Evidence of support from the universities involved and how the research complements institutional strategy

**Creativity@home**

EPSRC, working with professional facilitators, has set up an initiative to support project investigators, researchers and teams to help generate and nurture creative thinking and galvanise team dynamics that paves the way for individuals and teams to take creativity and radical idea generation to a higher level – the initiative is known as creativity@home.

Objectives for creativity@home include:
• Learning a range of creative problem solving tools and techniques and how this might aid creativity in research

• Engaging researchers in blue skies idea generation

• Learning how to work effectively in teams, understanding different styles of approaching problems and how to influence others

• Exploring the future research vision and cross-disciplinary opportunities in the group using new facilitation tools and techniques

• Developing a cohort of trained people that have learnt and are applying creative problem solving techniques so that the approaches and culture become embedded within the project team.

Activities that have taken place previously have included

• Training and subsequent support for project managers and students in creative facilitation techniques enabling them to run mini sandpits and cross-disciplinary idea generation workshops

• Away days for multidisciplinary teams exploring how they might work better/more effectively together

• Creative Problem Solving training for groups of researchers that enhances their approach to problem solving in their research

• Professionally facilitated idea generation workshops creating new research directions and people connections.

For creativity@home, you and the research programme team are the key resource. Your group will be given access to professional facilitators and the aims and objectives are left up to you and your group to decide. The professional facilitators will work in partnership with you throughout the initiative - the timescale and all facilitation activities will be planned in consultation with you. The facilitators will focus on the process enabling your group to think freely and explore new tools and exciting research directions.

Funding for creativity@home will be accessible via your grant award and is to pay for facilitator time, travel & subsistence and basic facilitator materials.

Creativity@home will typically cost circa £20,000 (80% fEC) for 4 days FTE for professional facilitators. Creativity@home is a flexible resource. For example, 4 days FTE may be split into eight 0.5 days or four 0.5 days and a two day ideas generation workshop. How best to use the resource is up to you to decide when exploring options with your chosen facilitators. There is no maximum value that you may apply for.

If your application is successful EPSRC will provide you with a list of facilitation companies that you may contact. Of course, you may already work with a facilitator; in this case, EPSRC is pleased for you to continue your engagement.

**How do I apply for creativity@home?**

If you are interested in working with professional facilitators to enhance your research programme then you should request resource to cover this in your grant application as follows:
• Je-S form – applicants should include appropriate resource to cover the creativity@home activity under the heading **Other Directly Incurred Costs**.

• Justification of Resources – justify why you believe that the creativity@home initiative will enhance the experience of the researchers and strengthen your research programme. Broadly outline what type of activities you are interested in pursuing and the associated need for the resource.

• Management plans – include details of your objectives for creativity@home and how the resource will be managed to deliver added benefit directly to your research team.

The assessment process will assess the benefit of the creativity@home activity to maximising the potential of your research programme.

For more information regarding creativity@home and to read about the experiences of other researchers please see the news article "Creative thinking in research", [http://www.epsrc.ac.uk/newsevents/news/2010/Pages/creativethinkinginresearch.aspx](http://www.epsrc.ac.uk/newsevents/news/2010/Pages/creativethinkinginresearch.aspx) and also the front page feature article entitled 'Meeting of Minds' in Connect issue 80 [http://www.epsrc.ac.uk/SiteCollectionDocuments/Publications/connect/Connect80.pdf](http://www.epsrc.ac.uk/SiteCollectionDocuments/Publications/connect/Connect80.pdf).

**Further Guidance**

**Guidance for applicants**

Information for applicants preparing full proposals can be found at: [http://www.epsrc.ac.uk/funding/appprev/preparing/Pages/proposal.aspx](http://www.epsrc.ac.uk/funding/appprev/preparing/Pages/proposal.aspx).

Guidance on the types of support that may be sought and advice on the completion of the research proposal forms are given on the EPSRC website [http://www.epsrc.ac.uk/funding/Pages/funding.aspx](http://www.epsrc.ac.uk/funding/Pages/funding.aspx) which should be consulted when preparing all proposals.

**User Engagement Strategy**

Successful applicants will be required to develop and execute a strategy for engaging with potential users of the research funded in the project (resources for this activity can be requested as part of the Pathways to Impact and must be justified in the application). This strategy should be reviewed and updated regularly as part of the formal management of the grant.

The strategy should cover:

• How and when potential users have been / will be identified

• What form the engagement will take

• What steps will be taken to ensure that outputs of the research are made available to potential users
Suitable metrics for determining the success of the strategy in delivering value to users.

Guidance for reviewers
Information about the EPSRC peer review process and guidance for reviewers can be found at: http://www.epsrc.ac.uk/funding/Pages/funding.aspx.

Additional grant conditions
In addition to the standard terms and conditions for grants, successful applicants will be required to:

a) Have a signed collaboration agreement between HEIs in place before the grant starts

b) Have a signed collaboration agreement with any project partner before that specific collaboration begins.

There will also be a requirement for the investigators to carry out a mid-term review of the activities funded through the grant. Specific grant conditions in relation to reporting will also apply where appropriate.

Key dates

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<th>Activity</th>
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<td>Call launched on web (EoI stage)</td>
<td>5 March 2013</td>
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<td>Closing date for EoIs</td>
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<td>Short-listing panel</td>
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<tr>
<td>Call opens in J-eS (Full proposal stage)</td>
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### Change log

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