



Manufacture using Advanced  
Powder Processes  
EPSRC Future Manufacturing Hub

**EPSRC**

Engineering and Physical Sciences  
Research Council

## 2<sup>nd</sup> Call for Feasibility Studies

### EPSRC Future Manufacturing Hub in Manufacture using Advanced Powder Processes (MAPP)

**Call Type:** Invitation for Proposals

**Closing Date:** 3<sup>rd</sup> November 2019

**Related themes:** Manufacturing the Future

#### Summary

MAPP, the EPSRC Future Manufacturing Hub, is offering funding for at least three feasibility studies to conduct novel research which closely aligns with the Hub's core research programme: Powders by Design and Process by Design. We are looking for research projects that align with and complement MAPP's research programme and have the potential to lead to further collaboration and funding bids.

The call is open to all UK academics eligible to receive EPSRC funding and is the primary mechanism for new academic collaborators to engage with the Hub. Awards are limited to projects with a maximum duration of six months and maximum value of £50,000 (80% FEC).

#### Key Dates:

Activity	Date
Call Launched	2 <sup>nd</sup> September 2019
Closing date for applications	3 <sup>rd</sup> November 2019
Evaluation of applications by	3 <sup>rd</sup> February 2020
Grants announced and feedback given by	11 <sup>th</sup> February 2020
Expected start date of projects (or within six months)	1 <sup>st</sup> June 2020

## Background

MAPP is a £20m EPSRC Future Manufacturing Hub in Manufacture using Advanced Powder Processes. Our aim is to deliver on the promise of powder-based manufacturing processes to provide low energy, low cost and low waste high value manufacturing routes and products to secure UK manufacturing productivity and growth. Led by the University of Sheffield, MAPP brings a leading interdisciplinary consortium from the Universities of Leeds, Manchester and Oxford, Imperial College London and University College London together with an initial group of 17 industry partners and 6 of the UK's High Value Manufacturing Catapult (HVMC) centres.

Our researchers draw on expertise from a variety of areas including materials science, automatic control and systems engineering and mechanical engineering. They are working on core research themes which span the fundamentals of powder materials, advanced *in-situ* process monitoring and characterisation and new approaches in modelling and control. Together our researchers are delivering new understanding and impact across the following areas:

- **Particulate science and innovation.** Powders will become active and designed rather than passive elements in their processing. Control of surface state, surface chemistry, structure, bulk chemistry, morphologies and size will result in particles designed for process efficiency / reliability and product performance.
- **Integrated process monitoring, modelling and control technologies.** New approaches to powder processing will allow us to handle the inherent variability of particulates and their stochastic behaviours. Insights from advanced in-situ characterisation will enable the development of new monitoring technologies that assure quality, and coupled to modelling approaches allow optimisation and control.
- **Sustainable and future manufacturing technologies.** Our approach will deliver certainty and integrity with final products at net or near net-shape with reduced scrap, lower energy use, and lower CO2 emissions. Recoupling the materials science with the manufacturing science will allow us to realise the potential of current technologies and develop new home grown manufacturing processes, to secure the prosperity of UK industry.

## Scope of the call

MAPP's research agenda covers emerging powder-based manufacturing technologies, including (but not limited to): spark plasma sintering (SPS), freeze casting, inkjet printing, layer-by-layer manufacture, hot isostatic pressing (HIP), and laser, electron beam, and indirect additive manufacturing (AM). MAPP covers a wide range of engineering materials where powder processing has the clear potential to drive disruptive growth - including advanced ceramics, polymers, metals, with our initial applications in aerospace and energy sectors - but where common problems must be addressed.

We are looking to fund research feasibility projects, which align with our Platform Research and incorporate ambitious and high risk ideas, which are complementary to MAPP's core research programme and have the potential to lead to substantive collaborative bids.

### **Powders by Design (Platform Research P1 theme).**

Powders are currently not well enough understood to easily enable consistent manufacture via powder processing routes. The traditional descriptors for powders – morphology, surface area, particle size distribution, compressibility and flowability – all fail to adequately describe their overall complexity as a system. Powders currently used within most processes are not designed for the process. Proposals here could consider (but are not limited to): new characterisation methods which support our systems level approach to describing powder behaviour in processes; modification of powder properties (chemistry, shape, size) to improve processing and final component properties.

### **Process by Design (Platform Research P2 theme).**

Powder processes are currently considered a black box and suffer from low manufacturing throughput. A lack of clear process control also results in a high incidence of component rejection due to manufacturing defects. Proposals here could consider (but are not limited to): new

approaches to metrology that offer new process understanding and/or opportunity for real-time in-process monitoring; new approaches to process modeling, taking advantage of the abundance of in-process data (real-time, historical) and data across the manufacturing supply chain; new approaches to optimisation and control, taking advantage of advances in machine learning and artificial intelligence.

## Funding available

Funding is available to a minimum of **three** feasibility awards. The maximum available for each award is £50,000 at 80% FEC for up to 6 months. Funding is intended to cover the costs of the PI and supporting researchers in undertaking research in preparation for a full grant proposal. Funding will therefore primarily cover staff time, with the remainder supporting consumables and travel. Funding for PhD students is not available.

## Equipment

Funding for purchasing new equipment is not permitted. However, access will be available to existing equipment at Hub and Spoke institutions, and charged at cost.

## Eligibility

This call is open to all UK academic institutions where applicants must be eligible to hold an EPSRC grant. We would especially welcome applications from early career researchers, but regret that we are unable to fund work at one of the existing MAPP partner institutions. If you need guidance on eligibility, please visit

<https://www.epsrc.ac.uk/funding/howtoapply/fundingguide/eligibility/investigators/>.

The University of Sheffield is the host organisation and will be administering the process. Awards will therefore not affect the applicant's eligibility for EPSRC New Investigator Awards.

## How to apply

Feasibility applications should be submitted directly to the MAPP Hub Operations Team ([mappadmin@sheffield.ac.uk](mailto:mappadmin@sheffield.ac.uk)). Applications should be no more than 4 sides of A4 using 2cm margins and standard Arial 11pt font. Proposals should include, but not be limited to the following content:

1. Research title, institution name and full name of the Principal Investigator (PI).
2. Start date and duration. (Projects should typically last for a maximum of 6 months)
3. Context, aim and objectives of the research, including a description to explain how the proposed project fits within the overall vision of the Hub and how it supports the development of the Hub's research agenda.
4. A statement of the novelty of the proposed research, including some evidence that it is not being addressed elsewhere or within the Hub's existing research programme.
5. A description of the methodology to be used, including a timing and resource allocation plan (Gantt chart).
6. A description of the tangible and measurable deliverables from the feasibility study, by which success can be measured.
7. A plan to show how you will attract further funding if your idea is feasible and the research is successful.
8. Any evidence of industrial interest or support.
9. A brief track record of the applicants relevant to this research area.
10. Justification of resources, summarising Directly Allocated (staff, estates costs, other), Directly Incurred (investigators, travel, consumables, infrastructure etc.), and Indirect Costs. A limit of 3.75hrs/week is imposed for Principal Investigators (this is a total for all investigators in the event of multiple investigators).

Successful applicants will be expected to engage fully with the Hub and will be supported by the Hub Operations Team. This engagement will include reporting of progress against objectives and participation in appropriate review meetings to ensure the collaborative opportunities and impact of the research are maximized.

## Assessment process

Submissions will be considered by a panel of Hub Executive Team members supported by independent assessors from the Hub's Advisory Boards to ensure a fair and unbiased process. In order of importance, the evaluation criteria for applications will be:

1. Fit to the scope of the call. Does the proposal address a fundamental aspect of improving manufacturing using advanced powder processes?
2. Does the proposal contain genuine scientific novelty?
3. Does the proposal contain suitable levels of challenge, ambition and risk?
4. How well has the proposal been planned? Are the requested resources appropriate and have they been fully justified?
5. Is there potential for developing a larger collaborative project, either at a similar fundamental level or at higher TRLs?
6. Is the proposal relevant to the interests of industrial partners and other stakeholders?
7. Do the proposed outcomes from the research have the potential to attract new industrial members to the Hub and leverage further industrial support?

## Contacts

For more details, please contact Elinor Noble or Jess Bamonte, MAPP Administrators, ([mappadmin@sheffield.ac.uk](mailto:mappadmin@sheffield.ac.uk) 0114 222 5504). Applicants are asked to consult their university's research office ahead of submitting a proposal to this call, in order to be clear of the requirements for meeting the deadlines set out above.

## Change log

Name	Date	Version	Change
Karen Wood		1	N/A