PhD Advert Template

Your advert (including section headings) should **not** exceed **550** words.

Project title: FunPrint: Recipes for Functional 3D Printable resins for heat transfer

Project ID *(optional)*:

Accept all year-round applications

Funding information: Self-funded students only

Project description:

**Background**

Many applications require cooling to function correctly: power generation (fossil fuel and renewables), motor vehicles (combustion and electric), motor racing, aircraft, space-craft, and the electronic device you are using to read this advert! As the development of these technologies continues, the cooling challenge becomes harder – more heat must be removed from smaller areas, often exceeding the capabilities of conventional heat transfer devices. One state-of-the-art solution is metal additive manufacturing (MAM), whose design freedom grants access to multiple new possibilities (*e.g.* biomimicry). However, MAM is neither affordable nor accessible to many researchers; typical machine costs alone exceed £250,000. The goal of FunPrint is to therefore develop recipes for UV-curable and printable resins that exhibit enhanced thermal conductivity performance. This would enable R&D of new heat transfer devices using affordable and accessible desktop-scale 3D-printers, which are typically only £100’s.

**Approach**

The challenge: most printable polymers exhibit very low thermal conductivities, typically of the order of ~0.1 Wm-1K-1 (which is between 2–3 orders of magnitude smaller than typical metals).

The potential solution: you will investigate the incorporation of a range of fillers and/or additives within the resin, along with the modification of the resin formulation itself, to enhance the thermal conductivity performance. Fillers will include various powders (such as copper, silicon carbide, *etc.*), metal reinforcement fibres (such as steel wool and steel structural fibre), and metal foils (such as aluminium foil and gold leaf). In principle, if the thermal conductivity can be increased to 15 W.m-1.K-1, a polymeric heat exchanger would only need to be around 5% larger (in size) than an equivalent titanium structure; the lower density of the polymer would also result in a lighter component overall.

Experimental work will include:

* Designing/developing CAD models of test coupons and other structures
* Fabrication of test structures containing different fillers/additives using a range of polymer 3D printers (already in place)
* Characterising the printed structures (*e.g.* dimensional tolerance measurements, stress/strain analysis, thermal conductivity measurements)

The successful candidate will become a member of the Process Intensification Group (PIG) [1], which is the largest of its kind in the World. PIG is highly collegiate and collaborative, so you will be well-supported throughout your project. The project itself is also well-funded; much of the existing equipment and consumables are in place meaning the experimental work can start quickly. Additive manufacturing/3D printing is still a growing area, so you will develop an important skill that will be highly-desirable in the future. If you invest your time in this project and PIG, we will ensure that you reach your career goals.

Applications from groups that are currently underrepresented in academia, such as members of the LGBTQ+ and Black, Asian, and Minority Ethnic (BAME) communities, are particularly encouraged.

**Prerequisites**

Essential: undergraduate degree in chemical or mechanical engineering

Desirable: some knowledge of CAD; experience of lab-based projects

Newcastle University is committed to being a fully inclusive Global University which actively recruits, supports and retains colleagues from all sectors of society. We value diversity as well as celebrate, support and thrive on the contributions of all our employees and the communities they represent. We are proud to be an equal opportunities employer and encourage applications from everybody, regardless of race, sex, ethnicity, religion, nationality, sexual orientation, age, disability, gender identity, marital status/civil partnership, pregnancy and maternity, as well as being open to flexible working practices.

References (optional):

[1] <http://pig.ncl.ac.uk/>

Application enquires:

[Dr Jonathan McDonough](https://www.ncl.ac.uk/engineering/staff/profile/jonathanmcdonough.html#background)

jonathan.mcdonough@ncl.ac.uk

**We will also need to link your PhD advert up to the subject keywords below so that your PhD studentship can be found on findaphd.com. Please highlight up to three relevant keywords from the lists provided below.**

**Chemical Engineering, 3D Printing, Polymers**

**FindaPhD.com**
You can select up to **10 subject areas**.

PhD Disciplines & Subject areas

Agriculture

[ ]  agricultural sciences

[ ]  agricultural technology

[ ]  arable farming

[ ]  livestock farming

[ ]  forestry & arboriculture

[ ]  other

Anthropology

[ ]  biological anthropology

[ ]  social anthropology

[ ]  other

Architecture, Building & Planning

[ ]  architecture

[ ]  built environment

[ ]  construction management

[ ]  landscape architecture

[ ]  rural planning

[ ]  surveying

[ ]  urban planning

[ ]  other

Biological Sciences

[ ]  bacteriology

[ ]  behavioural biology

[ ]  biochemistry

[ ]  biodiversity

[ ]  bioinformatics

[ ]  biophysics

[ ]  biotechnology

[ ]  cancer biology

[ ]  cell biology

[ ]  developmental biology

[ ]  ecology

[ ]  ecotoxicology

[ ]  entomology

[ ]  environmental biology

[ ]  evolution

[ ]  genetic engineering

[ ]  genetics

[ ]  genomics

[ ]  human genetics

[ ]  immunology

[ ]  marine biology

[ ]  microbiology

[ ]  molecular biology

[ ]  molecular genetics

[ ]  neuroscience

[ ]  parasitology

[ ]  plant biology

[ ]  plant cell biology

[ ]  reproductive biology

[ ]  structural biology

[ ]  systematic biology

[ ]  virology

[ ]  zoology

[ ]  other

Business & Management

[ ]  accounting

[ ]  business

[ ]  e business

[ ]  education management

[ ]  event management

[ ]  hospitality

[ ]  human resource management

[ ]  management

[ ]  marketing

[ ]  project management

[ ]  sport management

[ ]  tourism

[ ]  other

Chemistry

[ ]  analytical chemistry

[ ]  applied chemistry

[ ]  computational chemistry

[ ]  environmental chemistry

[ ]  industrial chemistry

[ ]  inorganic chemistry

[ ]  organic chemistry

[ ]  petrochemical chemistry

[ ]  pharmaceutical chemistry

[ ]  physical chemistry

[x]  polymer chemistry

[ ]  structural chemistry

[ ]  synthetic chemistry

[ ]  other

Communication & Media Studies

[ ]  broadcast media

[ ]  digital media

[ ]  journalism

[ ]  print media

[ ]  production

[ ]  public relations

[ ]  publishing

[ ]  other

Computer Science

[ ]  artificial intelligence

[ ]  computer architectures

[ ]  computer vision

[ ]  computer graphics

[ ]  cyber security

[ ]  data science

[ ]  human computer interaction

[ ]  internet of things

[ ]  machine learning

[ ]  networks

[ ]  quantum computing

[ ]  software engineering

[ ]  videogames

[ ]  other

Creative Arts & Design

[ ]  animation

[ ]  art

[ ]  crafts

[ ]  creative writing

[ ]  dance

[ ]  design

[ ]  drama

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[ ]  film studies

[ ]  fine art

[ ]  graphic design

[ ]  interior design

[ ]  music

[ ]  music technology

[ ]  photography

[ ]  theatre studies

[ ]  other

Economics

[ ]  econometrics

[ ]  financial economics

[ ]  macroeconomics

[ ]  microeconomics

[ ]  political economics

[ ]  other

Education

[ ]  further education

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[ ]  primary education

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Engineering

[ ]  acoustics engineering

[ ]  aerospace engineering

[ ]  atomic engineering

[ ]  automotive engineering

[ ]  bioengineering

[ ]  biomedical engineering

[x]  chemical engineering

[ ]  civil engineering

[ ]  communications engineering

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[x]  energy technologies

[ ]  environmental engineering

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[ ]  gas engineering

[ ]  geotechnical engineering

[ ]  integrated engineering

[x]  manufacturing engineering

[ ]  marine engineering

[x]  mechanical engineering

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[ ]  offshore engineering

[ ]  petroleum engineering

[ ]  robotics

[ ]  solid mechanics

[ ]  structural engineering

[ ]  structural mechanics

[ ]  systems engineering

[ ]  thermodynamics

[x]  other (3D Printing)

Environmental Sciences

[ ]  climate science

[ ]  hydrology

[ ]  marine sciences

[ ]  meteorology

[ ]  pollution

[ ]  soil science

[ ]  other

Finance

[ ]  actuarial science

[ ]  banking

[ ]  financial management

[ ]  insurance

[ ]  investment

[ ]  taxation

[ ]  other

Food Sciences

[ ]  food hygiene

[ ]  food production

[ ]  other

Forensic and Archaeological Sciences

[ ]  archaeological science

[ ]  forensic science

[ ]  other

Geography

[ ]  agricultural geography

[ ]  cultural geography

[ ]  economic geography

[ ]  environmental geography

[ ]  geographical information systems gis

[ ]  historical geography

[ ]  human geography

[ ]  marine geography

[ ]  physical geography

[ ]  political geography

[ ]  remote sensing

[ ]  social geography

[ ]  transport geography

[ ]  urban geography

[ ]  other

Geology

[ ]  applied geology

[ ]  geochemistry

[ ]  geophysics

[ ]  geoscience

[ ]  geotechnology

[ ]  hydrogeology

[ ]  marine geology

[ ]  palaeontology

[ ]  seismology

[ ]  volcanology

[ ]  other

History & Archaeology

[ ]  african history

[ ]  american history

[ ]  ancient history

[ ]  archaeology

[ ]  asian history

[ ]  australasian history

[ ]  british and irish history

[ ]  economic history

[ ]  european history

[ ]  heritage studies

[ ]  history

[ ]  history of art

[ ]  history of religions

[ ]  history of science

[ ]  medieval history

[ ]  military history

[ ]  modern history

[ ]  russian history

[ ]  social history

[ ]  world history

[ ]  other

Information Services

[ ]  information security

[ ]  information systems

[ ]  librarianship

[ ]  other

Languages, Literature & Culture

[ ]  african studies

[ ]  american studies

[ ]  asian studies

[ ]  australasian studies

[ ]  chinese

[ ]  danish

[ ]  dutch

[ ]  english language

[ ]  english literature

[ ]  european studies

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[ ]  german

[ ]  italian

[ ]  japanese

[ ]  middle eastern studies

[ ]  norwegian

[ ]  portuguese

[ ]  russian

[ ]  spanish

[ ]  swedish

[ ]  other

Law

[ ]  criminal law

[ ]  commercial law

[ ]  contract law

[ ]  property law

[ ]  other

Linguistics & Classics

[ ]  ancient greek

[ ]  celtic studies

[ ]  classics

[ ]  latin

[ ]  linguistics

[ ]  other

Materials Science

[ ]  ceramics

[ ]  glass

[ ]  metallurgy

[x]  polymers

[ ]  textiles

[ ]  other

Mathematics

[ ]  applied mathematics

[ ]  applied statistics

[ ]  computational mathematics

[ ]  data analysis

[ ]  engineering mathematics

[ ]  mathematical modelling

[ ]  medical statistics

[ ]  operational research

[ ]  probability

[ ]  pure mathematics

[ ]  statistics

[ ]  stochastic processes

[ ]  other

Medicine

[ ]  anatomy

[ ]  audiology

[ ]  biomechanics

[ ]  cardiology

[ ]  complementary medicine

[ ]  dentistry

[ ]  endocrinology

[ ]  epidemiology

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[ ]  neurology

[ ]  nutrition

[ ]  ophthalmology

[ ]  optometry

[ ]  pathology

[ ]  pharmacology

[ ]  pharmacy

[ ]  physiology

[ ]  physiotherapy

[ ]  podiatry

[ ]  radiology

[ ]  speech science

[ ]  tissue engineering

[ ]  toxicology

[ ]  other

Nursing & Health

[ ]  adult nursing

[ ]  community nursing

[ ]  counselling

[ ]  dental nursing

[ ]  environmental health

[ ]  health informatics

[ ]  medical nursing

[ ]  mental health nursing

[ ]  midwifery

[ ]  occupational health

[ ]  occupational therapy

[ ]  paediatric nursing

[ ]  paramedical science

[ ]  surgical nursing

[ ]  other

Philosophy

[ ]  ethics

[ ]  metaphysics

[ ]  philosophy of science

[ ]  other

Physics

[ ]  acoustics

[ ]  astronomy

[ ]  astrophysics

[ ]  chemical physics

[ ]  computational physics

[ ]  electromagnetism

[ ]  environmental physics

[ ]  experimental physics

[ ]  medical physics

[ ]  nuclear physics

[ ]  optical physics

[ ]  particle physics

[ ]  quantum mechanics

[ ]  solid state physics

[ ]  space science

[ ]  theoretical physics

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Politics & Government

[ ]  development studies

[ ]  government

[ ]  international relations

[ ]  politics

[ ]  public policy

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Psychology

[ ]  child psychology

[ ]  clinical psychology

[ ]  community psychology

[ ]  counselling psychology

[ ]  developmental psychology

[ ]  educational psychology

[ ]  forensic psychology

[ ]  health psychology

[ ]  neuropsychology

[ ]  occupational psychology

[ ]  organisational psychology

[ ]  psychotherapy

[ ]  sport psychology

[ ]  other

Sociology

[ ]  criminology

[ ]  disability studies

[ ]  gender studies

[ ]  socio economics

[ ]  social work

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Sport & Exercise Science

[ ]  sport coaching

[ ]  sport development

[ ]  sport performance

[ ]  sport technology

[ ]  sport therapy

[ ]  other

Theology & Religious Studies

[ ]  divinity

[ ]  religious studies

[ ]  theology

[ ]  other

Veterinary Sciences

[ ]  animal welfare

[ ]  veterinary dentistry

[ ]  veterinary medicine

[ ]  veterinary nursing

[ ]  veterinary nutrition

[ ]  veterinary pathology

[ ]  other