

THE UNIVERSITY OF MANCHESTER

PARTICULARS OF APPOINTMENT

FACULTY OF SCIENCE & ENGINEERING

SCHOOL OF MATERIALS

DIVISION OF X-RAY IMAGING

**RESEARCH ASSOCIATE IN IN SITU SYNCHROTRON IMAGING OF ADDITIVE
MANUFACTURING**

VACANCY REF: S&E-10513

Salary: Grade 6 £31,076 to £38,183 per annum according to experience

Hours: Full time

Duration: Fixed term from 1 October 2017 until 31 March 2020

Location: Harwell, Oxfordshire

Enquiries about the vacancy, shortlisting and interviews:

Name: Professor Peter Lee

Email: peter.lee@manchester.ac.uk

BACKGROUND

The University of Manchester: Prof. Lee's Group

You will work in Prof. Peter D. Lee's Group based in the offices and laboratories at the Research Complex at Harwell (RCaH), Rutherford Appleton Laboratory (RAL), in Oxfordshire. Prof. Lee is currently the deputy Director of the RCaH, his group's research projects are strongly linked to the large facilities at the Harwell Campus, including Diamond Light Source (DLS), ISIS Neutron source and the Central Laser Facilities. Prof. Iain Todd at Sheffield will co-supervise. Frequent travel to Sheffield and Rolls-Royce will be required.

You will be employed by the School of Materials at the University of Manchester (UoM), which is a world-renowned centre of excellence. The School of Materials is the largest academic Materials department in the United Kingdom. It is an internationally recognized centre of excellence in materials research with activities across a broad spectrum of structural and functional materials. Prof Lee directs a group of ca. 20 post doctoral researchers, PhD students, support staff and students developing X-ray synchrotron and laboratory source imaging, image quantification and image based multi-scale modelling techniques. These techniques are applied

to help address research challenges ranging from assessing novel materials for joint replacements through to aero engine applications.

Prof. Lee also co-directs the Manchester X-ray Imaging Facility (MXIF, www.mxif.manchester.ac.uk), which is based at Harwell; the MXIF was awarded the 2013 Queen's Anniversary Prize for contributions to New Techniques in X-Ray Imaging of Materials Critical for Power, Transport and Other Key Industries. The MXIF combines a wide array of facilities, ranging from state-of-the-art μ CT laboratory machines to the Diamond-Manchester Imaging Branchline and supports over 90 industries, 35 UK universities, and scientists from 25 countries worldwide. In addition to the beamline, the MXIF has a wide range of laboratory CT machines from the nano to macro scale, with two based at Harwell and the rest in Manchester. The MXIF is led by Prof. Lee at the RAL site and Prof. Phil Withers in Manchester. You will interact with a wide range of academics from Manchester, other universities, and industrial researchers from around the world.

JOB DESCRIPTION

You will help design and commission a unique process replicator that allows *in situ* synchrotron imaging of blown powder additive manufacturing, applying it to do world leading experiments and analysis.

Your core role will be to help design, commission, and apply unique *in situ* process simulator rigs for use in synchrotron, laboratory X-ray source and other modalities to image key phenomena and perform process optimisation. Your core project will be on radiographic, tomographic and reciprocal space imaging additive manufacturing; however, you will also perform synchrotron experiments in support of teams working on other processes, such as powder handling, sintering. You will also perform *in situ* mechanical and functional properties measurements of components made via advanced powder processes. You will analyse the time resolved 2D and 3D images using existing image processing techniques, as well as develop new ones. The aim of these *in situ* studies is to gain insights into advanced powder processes, informing and validating computer simulations and control algorithms. You will be working as part of Prof. Lee's group of researchers based at the Harwell Campus, and will collaboratively work on the core project and also help on others. The role will require travel within the UK and internationally to interact with collaborators.

The role requires excellent record keeping, timely delivery, interactions with the larger research team, and outstanding written and verbal communications skills.

Main Responsibilities

Indicative key responsibilities are listed below, with new responsibilities being assigned by Prof. Lee:

- To design, build and commission an *in situ* rig to study blown powder additive manufacturing processes, allowing direct observation and quantification.
- To plan and conduct laboratory & synchrotron X-ray imaging using the equipment above to test scientific hypotheses, helping write beamtime proposals
- To analyse the big data produced, implementing data segmentation strategies, and ideally developing new image quantification algorithms
- To interpret the images / quantification from a physical metallurgical and manufacturing

perspective.

- To maintain accurate, comprehensive and secure records of research data.
- To write technical reports for the sponsors and collaborators.
- To publish research in high quality academic journals
- To follow health and safety procedures to maintain a safe environment at work and prepare safety risk assessments.
- To mentor PhD students sited within the group and to work with visiting teams during experiments.
- To help engender a team ethos within the group, integrating into the scientific life at Harwell Campus.
- To help supervise postgraduate student projects
- To host and assist researchers (PG to Prof) from the MAPP Hub, and other visitors to the group.

PERSON SPECIFICATION

Please highlight in your application how you meet each of these criteria.

Essential

- PhD or equivalent experience in materials science, physics, mechanical/electrical or other appropriate engineering subjects
- Experience in advanced powder processes, ideally additive manufacturing
- An in depth knowledge of imaging and image analysis, ideally applied to X-ray radiography
- Experience in programming and/or algorithm development
- Knowledge of at least two of the following areas:
 - Experience in design & use of complex equipment, ideally for use on a synchrotron
 - Experience of X-ray tomography experiments
 - Experience of conducting and analysing experiments using a synchrotron or neutron source
- Knowledge of physical metallurgy
- An in depth knowledge of at least one of the microstructural characterisation techniques applied to powder manufactured components
- An excellent publication record in a relevant field
- Outstanding communication skills in English
- Experience in project management and handling multi-partner/site projects, ideally with industry
- Knowledge of safe working practices in laboratories
- Demonstrated ability to work independently and as part of a team, successfully completing complex research programmes, developing original research
- Ability to multi-task and prioritise your workload, meeting deadlines

Desirable

- Powder and laser safety
- Experience helping write beamline proposals

You should be eager to learn and implement complex time lapse radiographic and tomographic experiments at a synchrotron as well as to develop image analysis techniques in packages such as Matlab, Avizo or ImageJ. You will be working closely with a team of experts that will provide

training in specialist areas where you have gaps in knowledge on the condition that the overall skill levels and experience are appropriate.