

THE UNIVERSITY OF MANCHESTER
PARTICULARS OF APPOINTMENT
FACULTY OF SCIENCE & ENGINEERING
SCHOOL OF MATERIALS (BASED IN OXFORDSHIRE)
MANCHESTER X-RAY IMAGING FACILITY

Research Associate: In Situ Imaging of Powder Processes / Additive

Vacancy ref: S&E-10040

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

Hours: Full Time

Duration: Fixed Term – From 01 June 2017 to 30 November 2019

Location: Harwell, Oxfordshire

Responsible to: Professor Peter Lee

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 acting Director of the RCaH, and the group's research projects are also strongly linked to the large facilities at the Harwell Campus, namely Diamond Light Source (DLS), ISIS Neutron source and the Central Laser Facilities. Prof. Iain Todd at Sheffield will co-supervise, and frequent travel to Sheffield, and the other partners 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 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. The postholder will interact with a wide range of academics from Manchester, other universities, and industrial researchers from around the world, and will be expected to regularly travel to Sheffield, Manchester and the MAPP collaborator locations (Oxford, Imperial, Leeds and Industrial Collaborators).

JOB DESCRIPTION

You will help design and commission unique process replicators that allow *in situ* synchrotron imaging of additive manufacturing, powder handling, sintering, etc.

The post holder's 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. The post holder 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 *in situ* rigs to study 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 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, advanced manufacturing techniques
- Experience in advanced powder processes, ideally additive manufacturing
- An in depth knowledge of imaging and image analysis, ideally applied to X-ray radiography
- 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 microstructural characterisation techniques applied to powder manufactured components
- Experience in project management and handling multi-partner/site projects
- An excellent publication record in a relevant field
- 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
- Experience with additive manufacturing

The candidate 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. The candidate 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.