

PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	Design School
Supervisors	Principal supervisor: Dr Tianhong Gu (XJTLU) Co-supervisor: Prof Konstantinos Papadikis (XJTLU) Co-supervisor: Prof Karl Whittle (UoL) Co-supervisor: Dr Maulik Patel (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project (world-wide students)
Project Title	Green Electronic Interconnections (GEI) : Optimal Design for Lead-free Solders
Contact	Please email tianhong.Gu@xjtlu.edu.cn (XJTLU principal supervisor's email address) with a subject line of the PhD project title

Requirements:

The candidate should have an undergraduate degree with a first class or upper second class honours degree, and/or a master's degree with distinction or merit (or equivalent qualification) in Materials Science and Engineering or relative fields in Engineering and Science. The candidate is desirable to be familiar with relevant techniques in microstructure characterisation, e.g. SEM and TEM, and thermomechanical testing, e.g. tensile, fatigue, and compression, as well as having hands-on experience with computational simulation, e.g. Matlab and Abaqus.

Evidence of good spoken and written English is essential. The candidate should have an IELTS score of 6.5 or above, if the first language is not English. This position is open to all qualified candidates irrespective of nationality.

Degree:

The student will be awarded a PhD degree from the University of Liverpool (UK) upon successful completion of the program.

Funding:

The PhD studentship is available for three years subject to satisfactory progress by the student. The award covers tuition fees for three years (currently equivalent to RMB

99,000 per annum) and provides a monthly stipend of 5,000 RMB as a contribution to living expenses. It also provides up to RMB 16,500 to allow participation at international conferences during the period of the award. It is a condition of the award that holders of XJTLU PhD scholarships carry out 300-500 hours of teaching assistance work per year. The scholarship holder is expected to carry out the major part of his or her research at XJTLU in Suzhou, China. However, he or she is eligible for a research study visit to the University of Liverpool of up to six months, if this is required by the project.

Project Description:

Solder is a critical element for interconnecting components and lead (Pb)-free solder is a prerequisite for Green Electronic Interconnections (GEI). Today, Pb-based solders still dominate part of industrial usage. Developing innovative Pb-free solders towards GEI to replace the existing Pb-based solders in the aeroengine and automotive applications is significantly important due to its known toxicity and health & environment impacts. As demands for multifunction, high-performance and low-cost devices increase, there is a great need to consider device miniaturisation in wider GEI applications. This study will investigate new methodologies for solders, through conducting microstructure control & component fabrication, performing micromechanical testing & microstructural characterisation, and developing computational modelling & microstructural design, to design optimal Pb-free solder microstructures and establish a new approach guided for their formation during processing.

The key aim of this research is to design new Pb-free solder compositions and optimal solder microstructures desirable for resilience to increased temperature, tensile creep and fatigue damage. Thus, the objectives of this research are the following:

- (1) Establish effective methods to control the Sn grain size and orientation, and the type, length scale, and morphology of IMCs in solder joints to enable the manufacture of joints with optimum microstructures.
- (2) Conduct in-situ thermomechanical testing coupled with characterisation techniques of both solder joints and bulks to reveal the micro-mechanisms of failure in thermal and mechanical loading.
- (3) Establish microstructure-level modelling methods using data from (1) and (2) as inputs to clarify the failure mechanisms and validate against controlled thermomechanical tests.

For more information about doctoral scholarship and PhD programme at Xi'an Jiaotong-Liverpool University (XJTLU): Please visit

<http://www.xjtlu.edu.cn/en/study-with-us/admissions/entry-requirements>

<http://www.xjtlu.edu.cn/en/admissions/phd/feescholarships.html>

How to Apply:

Interested applicants are advised to email tianhong.Gu@xjtlu.edu.cn (XJTLU principal supervisor's email address) the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two reference letters with company/university letterhead
- Personal statement outlining your interest in the position
- Proof of English language proficiency (an IELTS score of 6.5 or above)
- Verified school transcripts in both Chinese and English (for international students, only the English version is required)
- Verified certificates of education qualifications in both Chinese and English (for international students, only the English version is required)
- PDF copy of Master Degree dissertation (or an equivalent writing sample) and examiners reports available

Informal enquiries may be addressed to Dr Tianhong Gu (email tianhong.Gu@xjtlu.edu.cn), whose personal profile is linked below, <https://www.xjtlu.edu.cn/en/study/departments/design-school/civil-engineering/department-staff/academic-staff/staff/tianhong-gu>.