

PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	School of Science
Supervisors	Principal supervisor: Dr Tianhong Gu (XJTLU) Co-supervisor: Dr Akhil Garg (XJTLU) Co-supervisor: Jiafeng Zhou (UoL)
Application Deadline	May 31st, 2026
Funding Availability	Funded PhD project (world-wide students)
Project Title	AI-Driven Discovery of Sustainable Nickel and Titanium Superalloys
Contact	Please email Tianhong.Gu@xjtlu.edu.cn with a subject line of the PhD project title. The supervisor's profiles are linked here: https://scholar.xjtlu.edu.cn/en/persons/TianhongGu

Requirements:

1. The candidate should hold an undergraduate degree with a first-class or upper second-class honours (UK system), or a master's degree with Distinction or Merit. For Chinese institutions, a minimum GPA of 3.5/4.0 or 80–85/100 (or equivalent) is required, in Materials Science and Engineering, or a closely related discipline in Engineering or Science.
2. The candidate is expected to have strong background knowledge and hands-on experience in (1) Alloy design and material processing, (2) Microstructure characterisation techniques, including XRD, SEM (EDS + EBSD), and TEM, (3) Thermomechanical testing methods, such as tensile testing, fatigue, creep, etc, (4) AI and machine learning applications in materials science would be an advantage.

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). It also provides up to RMB 16,500 to allow participation at international conferences during the period of the award. The scholarship holders are expected to conduct the majority of their research at XJTLU in Suzhou, China. However, they may apply for a short-term research visit to the University of Liverpool if the project requires it.

Project Description:

The relationship between processing, microstructure, and mechanical properties in nickel- and titanium-based alloys remains a fundamental scientific challenge. Conventional trial-and-error parameter optimisation limits the efficiency of basic research into microstructure evolution. Recent advances in in-situ characterisation and digital twin simulations generate large datasets, yet these remain underutilised due to a lack of integrated data-driven frameworks for basic materials research.

Nickel-based superalloys and titanium alloys exhibit complex phase transformations and deformation mechanisms. Their processing windows are narrow, often leading to anisotropic microstructures and residual stresses. High-throughput experimental and computational techniques have emerged, but a key challenge lies in linking heterogeneous data, from processing conditions to microstructural evolution and mechanical response at multiple length scales.

Artificial intelligence (AI) has demonstrated potential in materials science. Physics-informed machine learning (PIML) and graph neural networks (GNNs) can capture complex, multi-scale process–structure–property (PSP) relationships. However, for metallic alloys, robust frameworks that integrate real-time characterisation data, simulation, and experimental feedback for closed-loop fundamental investigations are still lacking.

This project will address this gap by combining high-throughput materials processing experiments, AI-based microstructure modelling, and autonomous experimental design to advance the fundamental understanding of Ni- and Ti-based alloy systems.

Research Questions:

1. How can AI models capture and generalise complex processing–microstructure–property relationships across different alloy systems?
2. Can physics-informed constraints improve the interpretability and reliability of AI predictions for microstructure evolution?
3. How can closed-loop optimisation accelerate fundamental research into composition–microstructure correlations?

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

<https://www.xjtlu.edu.cn/en/admissions/global/entry-requirements/>

<https://www.xjtlu.edu.cn/en/admissions/global/fees-and-scholarship>

How to Apply:

Interested applicants are advised to email Tianhong.Gu@xjtlu.edu.cn the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two formal reference letters
- Personal statement outlining your interest in the position
- Certificates of English language qualifications (IELTS or equivalent)
- Full academic 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