XJTLU-XJTU-UoL Joint Doctoral Supervision Project (Full-time)

Reference No.	SFXJTU2510
XJTLU School	School of Mathematics and Physics
PhD Programme	Mathematical Sciences
Supervisors	XJTLU supervisor: Dr Chen Xuan XJTU supervisor: Professor Hong Wang UoL supervisor: Professor Karl Coleman
Project Title	Research on thermoelectric parameter decoupling and key technique for high efficient and orderly heat-to-electricity conversion 面向能量高效有序转换的一维碳纳米管薄膜热电解耦机制与方法研究
Application Deadline	Open until the position is filled

Requirements:

A UK first-class or upper second-class honours Bachelor's degree and a UK Master's degree with Merit (or their equivalent) are required for PhD admissions. Exceptional candidates holding only a Bachelor's degree may be considered on an individual basis.

Evidence of good spoken and written English is essential. The candidate should have an IELTS (or equivalent) score of 6.5 or above, if the first language is not English.

For more information about entry requirements and admission procedures of PhD programme at XJTLU, please visit:

Entry Requirement - Xi'an Jiaotong-Liverpool University

How to Apply - Xi'an Jiaotong-Liverpool University

Programme Structure:

Doctoral students in the joint programme are registered with both XJTLU and the UoL. Upon successful completion of the programme, the students will be awarded a PhD degree from University of Liverpool.

During their doctoral studies at XJTLU, students are expected to conduct research at XJTU as visiting students. Additionally, students have the opportunity to apply for a three to six-month research visit to UoL.

Project Description:

Thermoelectric energy conversion technology can directly convert thermal energy into electrical energy by using the temperature difference. The bottleneck that restricts the improvement of the output power density of flexible thermoelectric devices is how to realize the decoupling of the three key thermoelectric parameters (electrical conductivity, Seebeck coefficient and

thermal conductivity). In order to solve this bottleneck, the applicant intends to carry out research from three levels: the thermoelectric parameters de-coupling mechanism, the preparation method of thermoelectric materials, and the structural design of thermoelectric devices: to reveal a new mechanism of thermoelectric parameters de-coupling based on the carrier quantum confinement effect and the mean free path difference between phonon and electron, to use the discontinuous characteristics of nanomaterials to control the Fermi level close to the van Hove singularity through doping, to achieve the decoupling of conductivity and Seebeck coefficient, and to control the cross-sectional width of nanomaterials to scatter phonon conduction electrons, so as to realize the decoupling of conductivity and thermal conductivity; The influence of temperature and solution on the arrangement of carbon nanotubes in the film will be systematically studied, and a new method for the preparation of high-density carbon nanotube films with good orientation and density based on the temperature Marangoni effect will be proposed. It is proposed to design a new device with variable cross-section and joint-free structure, which fundamentally eliminates the contact resistance in the device and provides the output power density of flexible thin-film thermoelectric devices. The relevant mechanisms and research results will enhance the innovation ability of China's thermoelectric energy conversion field from the theory, method and technical source, and promote the application of thin-film thermoelectric devices in waste heat power generation.

Joint Supervisory Team:

XJTLU supervisor: Dr Chen Xuan

XJTU supervisor: Professor Hong Wang

UoL supervisor: Professor Karl Coleman

How to Apply:

Interested applicants are advised to email Dr Chen Xuan (chen.xuan@xjtlu.edu.cn) or Professor Hong Wang (hong.wang@xjtu.edu.cn) the following documents for initial review and assessment (Please include 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