

PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	Design School
Supervisors	Principal supervisor: Dr Tianhong Gu (XJTLU) Co-supervisor: Prof Li Yang (XJTLU) Co-supervisor: Dr Songsong Zhang (JITRI) Co-supervisor: Dr Jiafeng Zhou (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project
Project Title	Design and Optimization of piezoelectric MEMS microphone
Contact	Please email Tianhong.Gu@xjtlu.edu.cn (XJTLU principal supervisor's email address) or Songsong.Zhang@chiponsensing.com (JITRI supervisor's email) with a subject line of the PhD project title

Requirements:

The candidate should have a first class or upper second class honours degree, and/or a master's degree with distinction or merit. For Chinese universities, GPA \geq 3.5/4.0 or 80-85/100) (or equivalent qualification) in Acoustic, Semiconductor Physics, Microelectronics, Mechanical Engineering, or related fields. Preference for candidates with research experience in acoustics. Proficiency in basic circuit design and simulation; experience in sensor development and simulation is a plus.

Evidence of good spoken and written English is essential. The candidate should have an IELTS score of 6.5 or TOEFL score of 90 or above, if the first language is not English. This position is open to all qualified candidates irrespective of nationality.

Please note that the joint PhD project is industry-based and the candidate is expected to undertake part of the research at the partner organization in China.

Degree:

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

Funding:

This PhD project is a collaborative research project between XJTLU (<http://www.xjtlu.edu.cn>) in Suzhou and JITRI (Jiangsu Industrial Technology Research Institute) - Shanghai Melon Technology Co. Ltd. 上海励珑科技有限公司. The student will be registered as an XJTLU PhD student but is expected to carry out the major part of his or her research at the Institute in Shanghai Melon Technology Co. Ltd (Jiading District, Shanghai.).

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). In addition, during the period of undertaking main research at institute in Suzhou and Shanghai, the PhD candidate will be provided with monthly living allowance of 3,300 RMB per month by JITRI (Jiangsu Industrial Technology Research Institute) - Shanghai Melon Technology Co. Ltd.

Project Description:

Piezoelectric MEMS microphones have the advantages of eliminating the need for vacuum packaging, low power consumption, and simplicity of fabrication. These advantages have led to further research into piezoelectric technology. Regardless of sensing technology, MEMS microphones have some basic parameters such as sensitivity, signal-to-noise ratio (SNR), bandwidth, output impedance and so on. These parameters together determine the performance of the microphone [2]. The performance of piezoelectric MEMS microphones is greatly affected by the piezoelectric materials. Among them, zinc oxide (ZnO), lead zirconate titanate (PZT) and aluminum nitride (AlN) as the most common piezoelectric materials, each has its own characteristics [3]. Compared with the fabrication difficulty of the other two materials, AlN has attracted much attention because of its compatibility with CMOS technology. Although the piezoelectric coefficient of AlN is not the highest of the three materials, there are ways to improve its piezoelectric coefficient. Recently, researchers have found that the incorporation of scandium (Sc) into AlN can effectively improve its piezoelectric properties. Then the performance indexes of piezoelectric MEMS microphone can be further improved on the basis of this scandium-doped aluminum nitride.

[1] Y. Seo, D. Corona, and N. A. Hall, "On the theoretical maximum achievable signal-to-noise ratio (snr) of piezoelectric microphones," SENSORS AND ACTUATORS A, 2017.

[2] Vm1000 Low-noise Bottom Port Microphone Data Sheet, Vesper Technologies Inc, 2017.

[3] Y.-C. Chen, S.-C. Lo, S. Wang, Y.-J. Wang, M. Wu and W. Fang, "On the PZT/Si unimorph cantilever design for the signal-to-noise ratio enhancement of piezoelectric MEMS microphone," Journal of Micromechanical and Microengineering, vol. 31, 105003 (16pp), 2021.

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>

Supervisor Profile:

Principal Supervisor:

Dr Tianhong Gu is presently an Assistant Professor in Materials Science and Engineering at Xian Jiaotong-Liverpool University (XJTLU). Previously she pursued material research in the UK at University of Cambridge, Imperial College London and University of Birmingham, with a focus on material microstructure control design, in-situ micromechanical testing microstructural characterisation and materials modelling to develop cross-disciplinary solutions for the next generation high-performance and substantial-reliability engineering materials in aerospace, automotive, electronics and nuclear applications. She is a specialist in understanding micromechanical deformation and microstructure, as well as in-situ microscope methods and analysis.

JITRI co-supervisor:

Dr. Zhang Songsong, graduated from the National University of Singapore in 2014, during which he majored in MEMS sensor design and semiconductor advanced manufacturing processes related to sensing technology. In 2014, he joined the Institute of Microelectronics, Singapore, where he became part of the sensor research and development department. He subsequently participated in industrial projects between multinational corporations such as Globalfoundries and STMicroelectronics, and independently led and coordinated several commercial projects in industrialization. He personally involved in the MEMS wafer fabrication process and successfully delivered the design. In 2019, he joined the Shanghai Microtechnology Industrial Research Institute (SITRI), where he was responsible for technical/product development in the advanced acoustics department, as well as managing the internal development and external business expansion of the piezoelectric aluminum nitride process platform. In 2020, he was awarded the Shanghai Talent title. In 2021, he was appointed as the project leader for the National Key R&D Program of China, overseeing all topics related to industrialization of piezoelectric MEMS. In 2023, he co-founded Chengdu Chimesen Co., Ltd., serving as Chief Technology Officer (CTO). Also in the same year, leveraging the Yangtze River Delta International Technology Innovation Center (NICE), he co-founded Shanghai Melon Technology Co., Ltd. in Jiading, taking full responsibility for the company's technological research and product industrialization.

How to Apply:

Interested applicants are advised to email Tianhong.Gu@xjtlu.edu.cn (XJTLU principal supervisor's email address) or Songsong.Zhang@chiponsensing.com (JITRI supervisor's email) 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