PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	Design School
Supervisors	Principal supervisor: Dr. Charles Loo (XJTLU) Co-supervisor: Professor Xiang Zhang (JITRI) Co-supervisor: Professor Roman Boulatov (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project
Project Title	New high performance lightweight materials - low-temperature synthesis of polymer polyetherketone ketone (PEKK) micro-nano composite with functionality
Contact	Please email charles.loo@xjtlu.edu.cn (XJTLU principal supervisor's email address) and/or xiang.zhang@uk.lucideon.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, or a master's degree (or equivalent qualification) in **Chemistry or Chemical Engineering**.

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.

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) Functional Materials Institute. 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 of Functional Materials.

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, the PhD candidate will be provided with monthly living allowance of RMB 1200-2500 per month and student accommodation will be provided by the Institute of Functional Materials.

Project Description:

Polyetherketone ketone (PEKK) and its nanocomposites are new materials for future generations of aerospace. It is a kind of polymer based on polyetheretherketone (PEEK) but further developed to have a backbone structure containing two ketone bonds and one ether bond, forming super-large π bonds along a polymer chain. As the most excellent special engineering plastic, polyetherketone ketone has a melting point of up to 360 °C and tensile strength of 148MPa. There are only three companies in the world that can produce polyetherketone ketones.

The resulting composite material has excellent properties. On the one hand, it comes from the strong stiffness of pure PEKK molecular structure (twice as high as the familiar PEEK), excellent high-temperature resistance, friction resistance, electrical insulation, corrosion resistance, and other comprehensive properties; Second, due to the excellent process technology of the project, the ultra-high molecular weight and low defect are realized; Third, due to the project's in situ synthesis technology, good interfacial bonding with other high-performance materials are achieved. Therefore, the synthetic project can also be used as an excellent medical material, as well as an excellent engineering material, and, after reinforcement with glass fiber or carbon fiber, it can be widely used for aerospace, aviation, navigation, 3D printing, automotive industry, and high-end medical devices.

聚醚酮酮（PEKK）及其纳米复合材料是新一代航空航天必须的新材料。是一种基于聚醚醚酮（PEEK）单超越PEEK的一种主链结构中含有两个酮键和一个醚键的重复单元，形成超大π键所构成的高聚物。聚醚酮酮作为性能最优异的结晶特种工程塑料，熔点高达360℃，拉伸强度为148MPa。全球现在仅有三家能够量产聚醚酮酮的企业，其中印度和法国企业的产能基本被欧美的航空产业垄断。

本项目是基于前剑桥大学皇家工院士的专利：低温-常温、常压的技术，一次合成出聚醚酮酮（PEKK）微纳米复合材料，是全球首创的新材料，包括直接合成的微纳米复合材料，例如微纳米陶瓷、玻璃、纳米碳管、碳纤维短纤维复合材料。由此合成的复合材料具备优异的性能。一方面源于纯PEKK分子结构更强的刚度（对比大家所熟悉的PEEK提高一倍）、出色的耐高温、耐摩擦、电绝缘、耐腐蚀等综合性能；第二由于项目优异的工艺技术实现的超高分子量、低缺陷；第三由于项目的原位合成技术实现了与其他高性能材料的均匀复合和优异的界面结合。因此，本项目的合成的新擦了可以作为优异的医学材料，也可以作为优秀的工程材料，与玻璃纤维或碳纤维复合制备增强材料后，能够广泛在航天、航空、航海、3D打印、汽车工业、高端医疗等国家战略行业具有广泛的应用。

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/feesscholarships.html

Supervisor Profile:

Principal Supervisor:

Dr. Charles Loo is an Associate Professor in Structural and Materials Engineering in the department of Civil Engineering at Xi'an Jiaotong-Liverpool University (XJTLU). He holds a BEng. (1st Class Hons) in Civil Engineering, and a MEng. in Structural and Foundation Engineering and a PhD in Structural Engineering from the University of Sydney. Dr. Loo also worked in the consulting industry for a number of years, designing complex structural facilities. He is a Chartered Professional Engineer with Engineers Australia with the Civil and Structural Engineering colleges (MIEAust CPEng NER APEC Engineer IntPE Aus). His research interests include multi-physical computational modelling, inverse analysis and optimisation, metamaterials, structural engineering, composites and smart sensors.

JITRI co-supervisor:

Prof. Xiang Zhang, Royal Society Industry Fellow at University of Cambridge, Principal Consultant at Lucideon, has over 40 years combined academia (20 years) and industrial (20 years) experience in advanced materials science and technology, an expert in advanced materials science and technology for Space, Aeroplane, Medical

Implants (e.g bone, stents, etc.), Medical Materials (e.g. drug free antibacterial technology), also world expert in polymer and polymeric hybrid materials sciences. As a scientist, he is passionate on "Science for Industry ", a new mission of the Royal Society, and believes fundamental but applied sciences are the key to industry R&D and solving problems facing the world. Prof. Zhang is also Head of the Lucideon Cambridge School of Advanced Materials and Head of Medical Materials and Devices. He is the author of three books. Prof. Zhang undertook his PhD and postdoctoral research at Cranfield University where he studied materials physics and nano/micro-mechanics and nano/micro-fracture mechanics of polymeric hybrid (organic and inorganic) materials. After spending a further four years on research for industrial applications, he was awarded an industrial fellowship at the University of Cambridge in 1995, where he carried out research on fundamental nano-mechanics and fracture mechanics, he was the first scientist who completed the study on ductile to brittle transitions of , which employed synchrotron SAXS, WAXS (wide angle and small angel X-ray scattering) to study in situ deformation and fracture down to nanometre scales, the results of which lead to completion of ductile to brittle transition theories and practice. Prof. Zhang's industry experience was gained in leading international healthcare companies, where, as Principal Scientist/Technologist, his work covered almost all aspects of medical materials and devices from R&D and manufacturing to technical services and QC. Prior to joining Lucideon, Prof. Zhang worked as Director of a technology company, in the field of nano-conductive materials and diagnostic medical devices.

How to Apply:

Interested applicants are advised to email charles.loo@xjtlu.edu.cn (XJTLU principal supervisor's email address) and/or xiang.zhang@uk.lucideon.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