UNNC-CNITECH, CAS Doctoral Training Partnership

It's essential that you have contacted the UNNC and/or CNITECH supervisors and agreed on a suitable collaborative PhD topic before submitting an application.

Formal applications should follow the instructions in 'How to apply' section.

Research areas

- New Material Science
- Advanced Manufacturing
- Electrical Machines and Drives
- Composite Materials
- Computer Science

Available PhD topics

PhD topic	A novel multi-surface laboratory model for biofilm growth on prosthetic implants
CNITECH Supervisor	Zhenlun Song
UNNC Supervisor(s)	Enrico Marsili
Short introduction & description of PhD	Prosthesis-related infection is a serious complication for patients after orthopedic joint replacement, which is currently difficult to treat with antibiotic therapy. Consequently, in most cases, removal of the infected prosthesis is the only solution to cure the infection. Biofilms of extracellular mucopolysaccharides or protein polysaccharide complexes by bacteria adhered to the surface of the prosthesis protect the bacteria from the attack of antibiotics and host cells is often implicated in prosthetic-related infections. While biofilm structure and function are relatively well-known for a handful of nosocomial pathogens in laboratory systems, the actual development of biofilms in presence of prosthetic surface is much less known. In fact, there is not an established model system for biofilm growth of bacterial infection on prosthetic after implantation. In this project, the PhD candidate will design and test a multiple surface system for biofilm growth of bacterial infection, in which planktonic bacteria are exposed to both host cells and implant surfaces, to simulate the post-operatory conditions occurring in actual patients. The candidate will then investigate the structure and activity of the biofilms formed to determine the specific effect of implant surface in stimulating/inhibiting bacterial growth and extracellular polymeric substance (EPS) formation, which is a key step of biofilm formation. This novel laboratory model will serve as an intermediate step between simplistic biofilm models (e.g., flow cells) and animal experiments, thus decreasing the cost of prosthetic development and providing actionable information for clinical practice.

	Enrico Marsili has more than 20 years of experience in biofilm cultivation and characterization. He has developed a biofilm-monitoring platform based on bioelectrochemical analysis of biofilm/material interface and is currently collaborating with clinicians to devise novel methods for biofilm assessment.
	Zhenlun Song and his team is currently engaged in the research and development of new orthopedic implant materials and devices, focusing on the impact of material surface treatment on combating infections. The team are interested in clinical analysis of device infection failure after orthopedic implant surgery.
Contact points	Informal inquiries may be addressed to Assoc Prof Enrico Marsili (enrico.marsili@nottingham.edu.cn) and Prof. Zhenlun Song (songzhenlun@nimte.ac.cn)
PhD topic	**A Reliable Ultra-Compact Microturbine Compressor System for More Electric Aircrafts**
CNITECH Supervisor	Xinmin Chen, Jiaqiang Wang
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas
Short introduction & description of PhD	In order to meet the key target of zero-emission aviation for cleaner and environmentally sustainable air transport, there is an increasing demand for highly efficient and cost-effective powertrain and propulsion architectures capable of high energy efficiency and long endurance flights of aircrafts, UAVs, turbine range extenders in hybrid-electric trucks and long-range ground vehicles. Still, key architecture performance, such as power-to-weight ratio, energy density, and reliability, must yet be improved. While lithium-ion/lithium polymer batteries, have high energy density with efficiency, their low power density (~1% of jet fuels), and large weight make them impractical for electric aircrafts. A microturbine electrical power unit using alternate fuel sources is the most promising solution for efficient, power-dense, and sustainable propulsion. However, current state-of-the-art microturbines frequently fail due to improper lubrication, and inadequate internal clearance for the bearing system. Bearing failure is the most common problem that impacts the components friction, fatigue life and the overall service life of microturbines. Globally, efforts to increase the service life and power-to-weight ratio of microturbines have been met with challenges of small-scale design and manufacturing limits.
	This research work will focus on the novel design of an ultra-compact microturbine compressor system. Key targets will include (i) Radically innovative design of a radial compressor-turbine wheel (multidisciplinary aerodynamics, rotordynamics and heat transfer analysis) with considerations given to design for additive manufacturing. (ii) By integrating air bearings into the compressor-turbine wheel architecture, the problem of component friction and improper lubrication that leads to extra heat build-up is completely eliminated. The turbine wheel can run at much higher speeds with improved dynamics and vibration damping, zero oil leakages and power-to-weight ratio. (iii) Furthermore, we will introduce an essential non-linearity into the system, such that the well-known 'whirl' instability of air bearings will be effectively mitigated.
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**Adaptive Control of Hybrid Octoplane UAV in Dynamic Agriculture Environment**
CNITECH Supervisor	Xinmin Chen, Jiqiang Wang
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas

Short introduction & description of PhD	Agriculture has benefited from many technical advances in recent years. UAVs along with cutting-edge technology are widely used in agriculture. The global agricultural drone market size was exhibited at USD 1.1 billion in 2022 and is projected to hit around USD 7.19 billion by 2032, growing at a CAGR of 20.7% during the forecast period 2023 to 2032. While the adaptive control of UAVs is a globally explored topic, the application within dynamic agricultural environments presents a unique and evolving challenge. The integration of hybrid UAVs in precision agriculture is gaining international attention, with research efforts primarily focused on optimizing efficiency, enhancing adaptability, and ensuring precision in spraying and monitoring tasks. This research aims to contribute to this dynamic landscape by addressing specific challenges encountered in the intersection of UAV control and the evolving agricultural context. This project is centered on the design and realization of an adaptive control system for a hybrid UAV designed with dual capabilities, encompassing both vertical-take-off-landing and fixed-wing modes integrated into single platform. The pioneering UAV design and control offers promising potential for significantly improving the efficiency and precision of pesticide spraying operation. The project initial phase entails the development of an accurate dynamical model of hybrid UAV equipped with spraying mechanism. Subsequently an adaptive control law will be designed to attain the precise maneuvering using two-loop (inner and outer-loop) control structure that should be capable of handling variable environment conditions, variable mass condition, malfunctioning of sensor and actuators. The proposed design will undergo rigorous evaluation and validation through simulations testing before proceeding to real-time implementation, ensuring a robustness and quantifiable assessment of its performance and assessment.
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**An Efficient and Compact Fuel-Bled Cooling Design for Aerospike Nozzles**
CNITECH Supervisor	Xinmin Chen, Jiaqiang Wang
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas
Short introduction & description of PhD	The increasing demand for broadband connectivity and the Internet of Things (IoT), as well as various optical, multispectral, and synthetic aperture radar (SAR) constellations have led to an exponential growth of the number of satellites to be launched. Aerospike engines are an efficient means of powering both large and small-scale satellite launchers. They offer the prospects of far less mass and far lower fuel consumption. The aerospike engine uses a simple gas generator cycle with a lower chamber pressure than typical rocket engines reducing the risk of a catastrophic explosion. Although low chamber pressures result in reduced performance, the aerospike's high expansion ratio makes up for this deficiency. Moreover, Because the combustion chambers can be controlled individually, the vehicle can be manoeuvred using differential thrust vectoring. One key challenge is the cooling of the nozzle due to its exposure to extreme temperatures. The central spike experiences far greater heat fluxes than that of a bell nozzle. Furthermore, the aerospike is more complex and difficult to manufacture than the bell nozzle. As a result, it is more costly. This research work will focus on the design of an efficient lightweight aerospike nozzle for improved thrust to weight ratio. Key research targets will be (i) high-fidelity combustion dynamics modelling via synergistic coupling of CFD (and experiments) aerothermodynamics and conjugate heat transfer analysis (ii) Theoretical/surrogate modelling of system including shape parameters and local rate of fuel injection. (iii)

	design space exploration for improved performance and heat transfer considering shape parameters and local rate of fuel injection.
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**An Efficient Liquid Cooling System for Battery Thermal Management of an eVTOL Hybrid-Electric Aircraft**
CNITECH Supervisor	Xinmin Chen, Jiaqiang Wang
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas
Short introduction & description of PhD	Currently, most eVTOL concepts consider only Lithium-ion battery powertrains due to their technological maturity. For these battery powered aircraft, the design of battery thermal management system (BTMS) is crucial as the waste heat of the electric propulsion system cannot be dissipated into the atmosphere by an exhaust. To have a highly effective BTMS, it should be able to address most thermal concerns, e.g, extracting higher heat loads during power-demanding flight phases such as long-period hovering and thermal propagation, for safe and efficient operations with acceptable weight penalties and capacity degradation. Results in the open literature show that liquid cooling can maintain the battery operating temperature within acceptable levels with a mass of less than 20% of the battery mass. It has been found that channelled liquid cooling is cost-effective with moderate BTMS weight and power.
	Furthermore, it is also important to minimize the onboard BTMS weight and power consumption. The BTMS weight reduces the specific energy of the battery pack, which will in turn reduce the eVTOL's aero-propulsive performance. In addition, higher BTMS power consumption results in less energy available for the flight. Other considerations may contain BTMS's noise levels, manufacturing costs, technological maturity, etc. This research project will focus on the following;
	• Develop a TMS model-guided neural network (MGNN) for intelligent analysis of constrained TMS for only battery and hybrid-electric eVTOL considering mission fuel burn and battery sizing.
	• An efficient liquid cooling TMS design and optimization aimed at specific eVTOL mission requirements, weight, power consumption and aero-propulsive performance.
	• Implementation of the TMS system in a prototype eVTOL to assess the feasibility of the system considering the specific mission requirements.
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**An Intelligent Energy Management System for Hydrogen Fuel Cell Hybrid-Electric Ultra-Long Endurance Aircraft**
CNITECH Supervisor	Xinmin Chen, Jiaqiang Wang
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas
Short introduction & description of PhD	The growing demand for carbon emission reduction and in global fossil energy use has initiated the need for novel propulsion architectures that contribute to high energy efficiency and long endurance flights of air transport. One key challenge has been its endurance or long hours of flight. Although lithium-ion/lithium polymer batteries have

	high energy density, their low power density, long charging time, reduced endurance and increase in weight and cost make them not suitable for such civil applications. Hybridisation of the propulsion system is considered the most suitable architecture for highly efficient long endurance UAVs and small aircrafts. It allows combining the advantages and performances of different power sources and balancing their limitations. Hybrid fuel cell and battery power supply have the benefits of increased endurance due to high energy and power densities, energy generation and storage. Such architectures require an active energy management system (EMS) that optimizes the power consumption, fuel use and heat dissipation from the powertrain components including the fuel cell and batteries.

Based on the idea of complementary advantages, the hydrogen fuel cell, energy storage batteries and other energy sources are combined for long endurance aircrafts. Research work will focus on (i) energy power system topology configuration and processing of multi-electric hybrid energy management methods; (ii) active energy management system based on machine learning realizes remote control and information collection of energy system, intelligent hybrid and adaptive charging of energy storage battery. The active energy management system with the converter as the core provides efficient hardware and software support for energy management control. Further studies will include (iii) the complex coupling relationship between mixed energy sources, energy and flight attitude, flight trajectory, and wind field and the development of an attitude and flight track control system. Demonstration applications will be realized on a high aspect ratio long endurance UAV. The UAV performance indicators: cruise speed 20 m/s, hydrogen storage ratio 7% (tentative), target flight time 12-24hrs. |
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**Cathode design for high-performance aqueous Zinc dual-ion batteries**
CNITECH Supervisor	Prof. Gang Wang
UNNC Supervisor(s)	Dr. Di Hu
Short introduction & description of PhD	Developing high-performance rechargeable batteries based on cost-efficient and sustainable materials is of significance to meet the growing energy storage demand and to resolve the intermittent energy output problems of renewable energy. Aqueous dual-ion batteries (ADIBs) are ideal choices due to their high safety (non-flammable), low cost, high working voltage and straightforward configuration. Cathode materials working under anion insertion/conversion chemistry play a key role in building high-performance ADIBs.

In this project, we will develop novel cathode materials for ADIBs with Zinc used as the anode. Different anions such as bis(trifluoromethane)sulfonimide (TFSI$^-$), chloride (Cl$^-$), bromide (Br$^-$) and iodide (I$^-$) will be involved. The electrolyte property will be evaluated from aspects of ionic conductivity and electrochemical stability window, and further correlated with solvation sheath structure of charge carriers. The anion storage mechanism of cathode materials will be investigated in details with the assistance of a series of modern in-situ characterization tools. Prototype ADIB will be demonstrated based on above novel cathode material design and optimized electrolyte. |
| **Contact points** | Informal inquiries may be addressed to Prof Gang WANG (gang.wang@nimte.ac.cn) and Dr. Di Hu (di.hu@nottingham.edu.cn). |
| **PhD topic** | **Conjugated Two-Dimensional Covalent Organic Frameworks for Water Treatment** |

CNITECH Supervisor	Prof. Tao Zhang
UNNC Supervisor	Prof. Jun He
Short introduction & description of PhD	Purification of water sources is one of the greatest challenges facing the world today, since huge areas of the planet are suffering from poor water quality because of the increasing contaminations from organic compounds as well as microorganisms. Two-dimensional covalent organic frameworks (2D COFs) especially that are connected by sp^2 carbon conjugated linkages have emerged as promising candidates for water treatment in recent years. Their excellent structural regularity, robust framework, and inherent permanent porosity provide an innovative platform for constructing novel organic materials with excellent adsorption, separation and catalytic properties, which are thus promising for different water purification processes. In this potential PhD project, we intend to extensively investigate the practical optimization of material synthesis process, efficacy assessment of pollutant removal/degradation, and its theoretical working mechanism, etc.
Contact points	Prof. Tao Zhang (tzhang@nimte.ac.cn); Prof. Jun He (Jun.He@nottingham.edu.cn)
PhD topic	**Design and Control of Piezo-electric Driven Multi-DOF Compliant Mechanism**
CNITECH Supervisor	Prof. Chen Silu
UNNC Supervisor(s)	Assoc. Prof. Dunant Halim
Short introduction & description of the PhD project	Compliant mechanisms are flexible mechanisms that transfer an input force or displacement to another point through elastic body deformation. The piezo-electric actuator has advantages of high-force density, high-precision, fast-reaction, thus becomes an ideal power source for the compliant mechanism. However, the methodology toward integrated design and control of the stage and the actuator to meet some specific ultra-precision applications, such as semi-conductors and bio-manufacturing is yet to be explored.
Contact points	Informal inquiries may be addressed to Prof. Chen Silu (chensilu@nimte.ac.cn) and Assoc. Prof. Dunant Halim (dunant.halim@nottingham.edu.cn).
PhD topic	**Development of high-performance environmentally friendly perovskite light emitting diodes**
CNITECH Supervisor	Dr. Chaoyu Xiang
UNNC Supervisor(s)	Dr. Hao Chen
Short introduction & description of PhD	Metal halide perovskites based on Pb have been successful in various fields, including solar power generation, display, and lighting. However, the commercial application of Pb-based perovskites is hindered by the toxicity of heavy metal components. Additionally, current fabrication process of Pb-based perovskites involves toxic organic solvents such as dimethyl sulfoxide and energy-consuming steps like vapour deposition. The limitations of Pb-based perovskites make it difficult to meet environmentally friendly standards. Therefore, this project aims to fabricate high-performance, environmentally friendly perovskite light-emitting diodes. The project proposes the investigation of three directions: (i) designing non-toxic Pb-free perovskites, (ii) substituting current toxic solvents with green solvents, and (iii) developing energy-saving non-vacuum fabrication processes for Pb-free perovskite light-emitting diodes. The aim of this project is to create a new path for perovskite commercialization in the real world.

Contact points	Informal inquiries may be addressed to Dr. Hao Chen (Hao.Chen@nottingham.edu.cn) and Dr. Chaoyu Xiang (xiangchaoyu@nimte.ac.cn).
PhD topic	**Development on key material and technology for large area, commercialized WO$_3$ based electrochromic devices**
CNITECH Supervisor	Prof. Ye YANG
UNNC Supervisor(s)	Prof. Jun HE
Short introduction & description of the PhD project	WO$_3$ based electrochromic device (ECD) with an ability of actively regulating the visible and infrared (IR) light and also an outstanding energy efficient performance has attracted more attention for its hugely potential application in smart window for energy-efficient building and light modulated skylight glass for electric vehicle. However, the higher cost, lower production efficiency, slower response time, and deep blue color in tinted state severely restrict the WO3 based ECD to be practically applied in a larger scale. Aiming to these targets, this project will conduct a series of in-depth researches including exploring the feasibility of using low-cost and non-Li elements as shuttle ion, achieving some new approaches to increase the response time and realize a neutral color via regulating composition and micro-structure of sputtered EC film, as well as high-quality device assembling.
Contact points	Informal inquiries may be addressed to Prof. Jun HE (Jun.He@nottingham.edu.cn) and Prof. Ye YANG (yangye@nimte.ac.cn).
PhD topic	**Efficient Energy Harvesting and Power Management System of Triboelectic Motors for Distributed Electric Aircraft Propulsion**
CNITECH Supervisor	Xinmin Chen, Jiaqiang Wang
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas
Short introduction & description of PhD	The growing demand for carbon emission reduction and in global fossil energy use has initiated the need for novel propulsion architectures that contribute to high energy efficiency and long endurance flights of air transport. One key challenge has been its endurance or long hours of flight. Although lithium-ion/lithium polymer batteries have high energy density, their low power density, long charging time, reduced endurance and increase in weight and cost make them not suitable for such civil applications.
	To mitigate the limitations with the applicability of the well advanced lithium ion/lithium polymer batteries technology in aircraft propulsion, different radical approach such as complete overhaul and redesign of propulsion system, propulsion system hybridization, distributed electric propulsion arrangement, etc., has been identified. Although each of the identified methods has achieved considerable improvement and trade-offs over the conventional propulsion designs, there is however a need to achieve a fully electric propulsion system which achieves a significantly improved power to mass ratio while achieving significant endurance or long hours of flight.
	I. Taking advantage of the uniqueness of the distributed method of aircraft propulsion, this work will focus on achieving an efficient method for triboelectric energy harvesting from the core of the electric propulsion motors in different design variations. This stage will involve design of UAV motors that incorporate triboelectric mechanism for energy harvesting during motion.

	II. Deploy the motorized triboelectric harvester module for test in UAV using the distributed methods of propulsion.
	III. Design and deploy active energy management system for the tribo-electrified motor configurations for electric aircraft applications.
	IV. Studying the complex relationship between flight attitude, flight trajectory, motor speed and wind field on the energy harvesting performances of the motor during take-off-cruise-landing.
	The demonstration applications will be realized on a high aspect ratio long endurance UAV. The UAV performance indicators: cruise speed 20 m/s, target flight time 12-24hrs.
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**High-conductive electrolyte membrane with functionalized anisotropic nanochannels for solid-state lithium battery**
CNITECH Supervisor	Prof. Baofu Ding
UNNC Supervisor(s)	Dr Yong Ren
Short introduction & description of the PhD project	Polymer electrolyte membranes are critical components in solid-state batteries, such as lithium-ion batteries. They conduct specific ions while isolating electrons, thereby facilitating and controlling specific electrochemical reactions and enhancing the energy density and safety of these batteries. Introducing ion conductive channels or ion-exchange functional groups into the polymer matrix through chemical and physical methods can effectively enhance ion conductivity. However, polymer electrolytes often encounter the task of low conductivity, limiting the development of solid-state battery performance. the trade-off between selectivity and throughput in electrolyte membranes remains a challenging issue. Based on this background, this project will focus on (i) Design and synthesis of new amphiphilic functionalized organic molecules, (ii) precise control of the self-assembly behaviour and polymerization kinetics of monomolecular entities, (iii) large-scale manufacturing processes for polymer electrolyte membranes. These efforts aim to strengthen the ion transport performance of polymer dielectrics, achieving precise sieving and efficient transport of specific ions.
Contact points	Informal inquiries may be addressed to Prof. Baofu Ding (bf.ding@siat.ac.cn) and Assoc. Prof. Yong Ren (yong.ren@nottingham.edu.cn).
PhD topic	**High-efficiency thermoelectric technology and rare earth luminescent materials, including electro-acoustic transport synergistic regulation of thermoelectric materials, interfacial connection and system integration of efficient thermoelectric devices, microstructure design and controllable preparation of scintillating ceramic and ceramic phosphor.**
CNITECH Supervisor	Prof Jun Jiang
UNNC Supervisor(s)	Dr Yong Ren

Short introduction & description of the PhD project	Thermoelectric materials enable the direct conversion of heat energy into electrical energy through the Seebeck effect. High-efficiency thermoelectric technologies focus on maximizing this conversion efficiency, making them valuable for applications like waste heat recovery, portable power generation, and improving the efficiency of cooling systems. • **Material Innovations:** Advances in materials, such as new thermoelectric alloys and nanostructured materials, have significantly improved the performance of thermoelectric devices. • **Waste Heat Recovery:** High-efficiency thermoelectric generators can capture and convert waste heat from industrial processes, automotive exhaust, and electronic devices into usable electrical power. • **Portable Power Generation:** Thermoelectric modules are employed in portable devices to harness energy from temperature differences, extending the battery life or even eliminating the need for traditional batteries in some cases. Rare earth luminescent materials achieve luminescence through excitation electron transitions. And are widely used in LED lighting, display technology, biomedical imaging, sensors, laser materials, and other fields. It is significance for improving the performance of new optoelectronic functional materials and achieving efficient and energy-saving lighting and display technologies. • **Lighting Technology:** Fluorescent ceramics. By designing the microstructure and composition of fluorescent ceramics to achieve high-efficiency, high brightness and long-distance luminescence, such as LED and LD. • **Biomedical imaging:** Scintillating ceramics. By designing the microstructure and composition of scintillating ceramics to achieve high-resolution and high-contrast imaging, such as CT and PET. Both high-efficiency thermoelectric and lighting technologies play crucial roles in the pursuit of sustainable and energy-conscious solutions across various industries. They contribute to reducing overall energy consumption, lowering greenhouse gas emissions, and improving the overall efficiency of systems and devices.
Contact points	Informal inquiries may be addressed to Dr Yong Ren (yong.ren@nottingham.edu.cn) and Prof Jun Jiang (jjun@nimte.ac.cn).
PhD topic	**Hybrid Organic-Inorganic Perovskite Solar Cells**
CNITECH Supervisor	Prof. Ziyi Ge
UNNC Supervisor(s)	Dr. Bencan Tang
Short introduction & description of the PhD project	This PhD project is centred on the cutting-edge field of hybrid organic-inorganic perovskite solar cells (PSCs), a rapidly emerging technology in the renewable energy landscape. With the urgent need for alternative energy sources due to environmental concerns and fossil fuel depletion, this research aims to push the boundaries of PSCs, which have already demonstrated impressive advancements in power conversion efficiency and mechanical flexibility. The project will explore a holistic approach to enhancing the efficiency and durability of hybrid organic-inorganic PSCs. It begins with a comprehensive study of the unique optoelectronic properties of perovskite materials, identifying opportunities for material modifications to improve their performance and stability. A key focus will be on the

	development of new compositions and structures within the perovskite layer to reduce defects and increase efficiency.
	The project will also undertake the optimization of the overall device architecture. This includes refining the design and composition of functional layers such as substrates, electrodes, and transport layers, to enhance the efficiency and mechanical resilience of PSCs.
	Students from a chemistry background with some experience in organic synthesis would be ideal for this project.
Contact points	Informal inquiries may be addressed to Dr. Bencan Tang (Bencan.Tang@nottingham.edu.cn).
PhD topic	**Injectable and Biodegradable Drug Release Systems for Enhanced Therapeutic Efficacy**
CNITECH Supervisor	Prof. Jiantao Zhang
UNNC Supervisor(s)	Dr. Jing Wang
Short introduction & description of the PhD project	This PhD project will focus on advancing the field of drug delivery through the development of injectable and biodegradable drug release systems. Harnessing the potential of biomacromolecules, the project will target to design innovative systems that allow for controlled and sustained release of therapeutics, optimizing their efficacy while minimizing side effects. The research will delve into the integration of biodegradable polymers, cutting-edge process and formulation techniques, and advanced characterization methods to address current challenges.
	The objective of this PhD project is to develop injectable drug delivery systems that offer precise control over the release kinetics of biomacromolecules. The research will involve:
	1. Investigating and selecting biodegradable polymers and materials suitable for injectable drug delivery systems.
	2. Designing and engineering devices that prepare injectable particles with well controlled particle size and size distribution.
	3. Developing formulations that ensure stability, biocompatibility, high loading efficiency and controlled release.
	4. Employing advanced analytical methods to characterize the drug-loaded systems. Utilizing spectroscopy, chromatography, and microscopy to gain insights into the structural and performance of the formulations. Optimizing formulations will be required to achieve desired release profiles.
	5. Conducting in vitro and potentially in vivo studies to assess the performance and therapeutic efficacy.
	The project needs: 1) collaborating with experts in pharmaceutics, chemistry, and biomaterials science to integrate diverse perspectives; 2) Participating in interdisciplinary research activities among different groups.
	This PhD project offers a unique opportunity for a motivated and talented student to make significant contributions to the development of next-generation injectable and biodegradable drug release systems, addressing critical challenges in personalized and targeted therapeutic interventions. The successful candidate will play a critical role in shaping the future landscape of drug delivery for improved healthcare outcomes.

Contact points	Informal inquiries may be addressed to Prof. Jiantao Zhang (zhangjiantao@nimte.ac.cn) and Dr. Jing Wang (Jing.Wang@nottingham.edu.cn).
PhD topic	**Machine Learning-enabled composition and structure design of lightweight wear- and corrosion-resistant metal matrix composites**
CNITECH Supervisor	Prof. Keke Chang
UNNC Supervisor(s)	Dr. Hao Chen
Short introduction & description of the PhD project	This project aims to develop an AI-driven design and optimization loop of lightweight metal matrix composites (MMCs) by integrating machine learning and image recognition technologies. The focus is on using these advanced techniques to improve the wear- and corrosion-resistance of MMCs synergistically. Specifically, the project will explore data-driven methods for predicting phase transformation behaviours, improving interface microstructures, and increasing manufacturing efficiency. The incorporation of image recognition will enable more accurate analysis and characterization of MMCs, and help to establish the interactive relationship of composition-structure-performance. This innovative approach promises to push the boundaries of material science, potentially leading to significant advancements in various modern industrial sectors.
Contact points	Informal inquiries may be addressed to Prof. Keke Chang (changkeke@nimte.ac.cn and Dr. Hao Chen (Hao.Chen@nottingham.edu.cn).
PhD topic	**Mechanisms of passivation and passivity breakdown of multi-principal elements alloys (high-entropy alloys, MCrAlY high temperature alloys, etc.)**
CNITECH Supervisor	Prof. Jibin Pu
UNNC Supervisor(s)	Prof. Honglei Zhang, Dr. Mina Liu
Short introduction & description of the PhD project	To raise the corrosion resistance of alloys applied in increasingly harsh service conditions, high-entropy alloys (HEAs) have emerged as a new class of alloys, which show excellent mechanical properties, high temperature stability, and corrosion resistance. Normally, surface oxidation and the formed oxide film is of paramount importance in determining the corrosion response of HEAs. Atomistic simulations and microscopic techniques reveal that oxidation proceeds via simultaneous inward/outward diffusion of oxygen/metal atoms, which is expected to be greatly affected by alloy composition. That is to say, the composition, structures, and properties of the oxide will be significantly complicated by multi-principal elements (relying on their physico-chemical properties) in HEAs. Moreover, the oxidation kinetics and thus the thickness of passive film also depend on surface state (crystalline facet, roughness, etc.), oxygen partial pressure and temperature. In a word, oxidation of HEAs is actually a rather dynamic process at an alloy/oxide/aqueous solution interface. To gain a fundamental understanding of the initial-state oxidation mechanisms of HEAs, the exact role(s) of alloy composition on diffusion in an atomistic scope is needed.
Contact points	Informal inquiries may be addressed to Prof. Jibin Pu (pujibin@nimte.ac.cn), Prof. Honglei Zhang (honglei-zhang@nottingham.edu.cn), and Dr. Mina Liu (mina.liu@nottingham.edu.cn).
PhD topic	**Multifidelity Data Fusion based on Deep Hierarchical Feature Learning for Robust Aircraft Aerodynamic Predictions**
CNITECH Supervisor	Xinmin Chen
UNNC Supervisor(s)	Richard Adjei, Salman Ijaz, Christos Spitas

Short introduction & description of the PhD project	Digital transformation of more-electric aircraft systems towards the digital twin paradigm has significantly enhanced the acquisition, processing and analysis of data particularly for aircraft aerodynamic predictions. The fundamental idea is to develop a simulator integrating high-fidelity physics models, historical flight-test data, and numerical models among others, to mirror the operation of the corresponding aeroengine twin. The steady growth in computational capabilities and the advent of machine learning in the past few decades have assisted aircraft manufacturers to numerically simulate performance under real flight condition. This comes at a significantly cheaper cost than the wind tunnel or flight test and thereby supplementing them to a good extent. On the other hand, flight test and wind tunnel data, though not abundant are available in non-negligible amounts. Numerical simulations at the practical scale are seldom exact and suffer from model uncertainty errors, whereas measurements are noisy, incomplete and could be contaminated by errors introduced due to model scale instrumentation among others. Therefore, as a means to realizing the digital twin (DT) vision, there is the need to take advantage of the available multisource data by combining them in a fashion that make them more accurate under uncertainty than their individual fidelities. In this research work, an efficient multifidelity data fusion via machine learning for robust aerodynamic predictions will be developed and implemented. Research targets will focus on (i) pointNET deep hierarchical learning for 3D reconstruction of high and low-fidelity aircraft wing-body datasets. (ii)multifidelity Montecarlo estimator (MFMC) for uncertainty estimation of aerodynamic objectives (iii) design space exploration using the developed model for robust sensitivity study and optimization of the aircraft wing-body design
Contact points	Informal inquiries may be addressed to Dr. Richard Adjei (richard-amankwa.adjei@nottingham.edu.cn) and Professor Xinmin Chen(chenxinmin@nimte.ac.cn)
PhD topic	**Multimodal learning algorithms driven by large-scale protein language models for targeted protein modification and practical applications of protein modification using deep learning**
CNITECH Supervisor	Prof. Jianping Zheng
UNNC Supervisor(s)	Dr. Sen Yang
Short introduction & description of the PhD project	Proteases have a very wide range of applications in various industries, such as gene sequencing, environmental testing and instant diagnostics, etc. However, the functionality that their natural type (wild type) possesses is difficult to be applied in real complex application scenarios (e.g., GOD in POCT blood glucose meter requires higher specificity and stability, etc.), so the function of enzymes needs to be optimized for different usage scenarios. Deep learning-based modification methods are one of the most promising technologies that can explore undiscovered protein mutants that meet the needs and reduce the experimental costs in protein engineering. However, the technology is not yet mature enough to guarantee its accuracy. Based on this, this project focuses on three topics: (i) how large-scale protein language models can guide protein engineering; (ii)developing deep learning algorithms using protein multimodal information to improve modification efficiency; and (iii) applying developed algorithms to the targeted modification of multiple proteins (e.g., DNA polymerase for gene sequencing, glucose oxidase for blood glucose testing, etc.).

Contact points	Informal inquiries may be addressed to Dr. Sen Yang (Sen.Yang@nottingham.edu.cn) and Prof. Jianping Zheng (zhengjianping@nimte.ac.cn).
PhD topic	**Organic solar cells/ perovskite photovoltaics**
CNITECH Supervisor	Prof. Ziyi Ge
UNNC Supervisor(s)	Prof. Tao Wu
Short introduction & description of the PhD project	With the rapid development of the economy, non-renewable resources such as fossil fuels and natural gas are being depleted. One solution to maintain sustainable development is to utilize solar energy, which can be harvested directly through photovoltaic (PV) technology to produce electricity. In recent years, organic solar cells /Perovskite photovoltaics in the PV field have attracted more and more attention due to their advantages of low cost, flexibility, light weight, and large area producibility using roll-to-roll technology. However, how to further improve devices' performance and overcome their inherent drawbacks, such as instability, which should be carried out. This project will focus on developing new organic or perovskite materials and fabrication of solar cells.
Contact points	Informal inquiries may be addressed to geziyi@nimte.ac.cn and tao.wu@nottingham.edu.cn.
PhD topic	**Preparation of Monodisperse Magnetic Beads for Biomolecule Extraction and Highly Sensitive Molecular Diagnosis Assay**
CNITECH Supervisor	Prof. Jianping Zheng
UNNC Supervisor(s)	Prof. Yong Ren
Short introduction & description of the PhD project	The magnetic particles are one of the most important IVD raw materials and are being used extensively for biomolecule extraction, selective cell separation and for immunomagnetic separation within microbiology and molecular biology. However, in China almost 85% of magnetic particles are imported from developed countries, it is very important to develop new monodisperse magnetic beads with independent intellectual property rights and investigate functionalization of magnetic beads for highly sensitive diagnosis assay of target molecules. Based on the background above, the aim of this project is to 1) develop novel preparation methods of mono-sized magnetic beads including less than 100nm, 500nm, 1um and 2.8um particles. 2) Functionalize magnetic beads with specific biological recognition molecules for capturing and enriching target molecules from biological samples. 3) develop microfluidic chip to realize selective capture and enrichment for improved sensitivity and specificity of molecular diagnosis based on magnetic beads assay.
Contact points	Informal inquiries may be addressed to Dr Yong Ren (yong.ren@nottingham.edu.cn) and Prof Jianping ZHENG (zhengjianping@nimte.ac.cn).
PhD topic	**Radiative cooling based upon the optical modulation of optical materials and the dual-band spectral manipulation of thin film system.**
CNITECH Supervisor	Prof. Hongtao Cao
UNNC Supervisor(s)	Dr. Hao Chen
Short introduction & description of the PhD project	The application of radiative cooling can be traced back to ancient time as the ancestors made ice in the nocturnal time even the ambient temperature is above 0 ℃. This approach can passively decrease the ambient temperature through heat radiation

without energy consumption, providing a solution to compensate problems raised by global warming. The scientific concept of radiative cooling first came up in 1826, whose critical point is to enhance the heat exchange between the Earth and the outer space within the atmospheric window (AW, 3-5, 8-13, 16-28 μm), while prevent the systemic solar irradiance absorption (0.2-2.5 μm). Therefore, the project mainly focuses on the spectral manipulation of thin film system. Besides, considering the performance optimization and integration of the designed film system, the project also involves the optical modulation of the relative materials, including the broadening of the absorption band and the enlargement of the resonance dielectric refractive index.

This project will focus on two major optical dimensions on (i) high reflection in solar irradiance range and (ii) selective absorption in infrared regime.

Contact points	Informal inquiries may be addressed to Prof. Hongtao Cao (h_cao@nimte.ac.cn) and Dr. Hao Chen (Hao.Chen@nottingham.edu.cn).
PhD topic	**Refractive index engineering, optical phase control, and artificial film fabrication for achieving novel photonic absorbers**
CNITECH Supervisor	Prof. Hongtao Cao
UNNC Supervisor(s)	Dr. Jing Wang
Short introduction & description of the PhD project	Photonic absorbers are widely used in in many scenarios, including resonators, nano-lasers, the Purcell effect, and so on. However, there are still some urgent issues to be addressed. On the one hand, limited by interferometric principle, how to surpass the quarter-wavelength thickness limitation on the optical cavity? On the other, how to manipulate light propagation at deep-subwavelength scales in an absorber without using complex and expensive nanotechnology process? This project will focus on refractive index engineering and optical phase control scheme to miniaturize the designed absorbers, finally finding out their potential applications.
Contact points	Informal inquiries may be addressed to Prof. Hongtao Cao (h_cao@nimte.ac.cn) and Dr. Jing Wang (Jing.Wang@nottingham.edu.cn).
PhD topic	**Research on the high-speed point-to-point motion control of the semiconductor bonding machine's XY motion platform**
CNITECH Supervisor	Prof. Chi ZHANG
UNNC Supervisor(s)	Dr. Dunant HALIM
Short introduction & description of the PhD project	The XY motion platform, a pivotal component of semiconductor packaging equipment, is a critical factor constraining the precision and efficiency of packaging devices. The project addresses the performance requirements of high-quality semiconductor packaging equipment, specifically focusing on the high-speed and high-precision XY motion platform. Linear motors are widely used in semiconductor manufacturing equipment due to their superior dynamic performance and positioning accuracy compared to rotary motors with ball screws. However, the control performance of linear motors is affected by various factors, such as time delay, disturbances, and model uncertainties. The segmented ternary composite control method is developed. The motion-profile-based feedforward controller is only engaged during the motion tracking period, and the disturbance observer (DOB) is employed exclusively during the settling period to attain precise positioning while minimizing the negative impact on dynamic performance. However, the residual vibration during the settling period is not

	sufficiently suppressed, nonlinear disturbances are not specifically compensated, and dual-axis synchronous control is not achieved.
	Therefore, this project will focus on three major dimensions:
	(i) designing more effective residual vibration suppression strategies;
	(ii) minimizing the impact of thrust fluctuation and nonlinear friction on the trajectory tracking accuracy of linear motors;
	(iii) studying the coupling mechanism between the X-axis linear motor and the Y-axis linear motor and achieving dual-axis synchronous control.
Contact points	Informal inquiries may be addressed to Dr. Dunant HALIM (dunant.halim@nottingham.edu.cn) and Prof. Chi ZHANG (zhangchi@nimte.ac.cn).
PhD topic	**Research on thermal-sprayed functional ceramic coatings with photothermal property**
CNITECH Supervisor	Prof. Hua Li
UNNC Supervisor(s)	Dr. Hao Chen
Short introduction & description of the PhD project	Photothermal materials hold immense potential in many applications ranging from energy conversion to thermal management systems. The ability to harness and manipulate photothermal effect in ceramic coatings can contribute to groundbreaking advancements in renewable energy, environmental engineering, smart material design, and other fields.
	Thermal spraying presents a versatile and effective method for fabricating these functional ceramic coatings. It allows for the deposition of coatings on a wide range of substrates, regardless of their melting points, providing a significant advantage in terms of material compatibility. Meanwhile, it offers the advantage of engineering coatings with specific microstructures and tailored properties.
	The main objective of this project is to develop and optimise ceramic coatings that demonstrate superior photothermal efficiency and durability via thermal spraying. By harnessing the advantages of thermal spraying, this project aims to deliver transformative solutions that are economically viable and technologically advanced, setting new benchmarks in the field of photothermal ceramic coatings.
Contact points	Informal inquiries may be addressed to Prof. Hua Li (lihua@nimte.ac.cn) and Dr. Hao Chen (Hao.Chen@nottingham.edu.cn).
PhD topic	**Spatial Consumption of Charge Carriers in BaTaO$_2$N-Based Photocatalyst Sheets for Efficient S-Scheme Overall Water Splitting**
CNITECH Supervisor	Prof. KUANG Yongbo
UNNC Supervisor(s)	Dr Shahid Iqbal
	Dr Muhammad Sajjad
Short introduction & description of the PhD project	Photocatalytic generation of H$_2$ and O$_2$ are considered promising and economically feasible strategies to reduce the dependence on fossil fuels and solve worldwide energy issues. Inspired by the natural photosynthesis process, step-scheme (S-scheme) artificial photocatalytic systems comprising of two distinct photocatalysts are very attractive for realizing overall water splitting. As a result, the designing and construction of robust, highly efficient, and visible light-responsive overall-water-splitting semiconductor-based photocatalysts (multi-components) is a core issue.

A novel 2D/2D S-scheme heterojunction will be designed through the in-situ method by perfect integration of Earth-abundant semiconductors ($BiVO_4$, $BaTaO_2N$ and $Ti_3C_2T_x$) that have different energy levels to achieve efficient photoinduced charge generation, separation, and transportation. Characterization and confirmation of the formation of S-scheme-based 2D-2D heterojunction with the help of different cutting-edge techniques. Tuning the structural and electronic properties of $BaTaO_2N$ for enhanced photocatalytic performance. The present study aims to investigate the inherent correlation between photocatalytic activity and the thickness of the redox mediator, Ti_3C_2Tx.

Contact points	Informal inquiries may be addressed to Dr Shahid Iqbal (Shahid.Iqbal@nottingham.edu.cn) and Prof KUANG Yongbo (kuangyongbo@nimte.ac.cn).
PhD topic	**Surface and interface engineering of 2D materials for applications in advanced thermal interface materials**
CNITECH Supervisor	Cheng-Te Lin (https://www.researchgate.net/profile/Cheng-Te-Lin)
UNNC Supervisor(s)	Bo Li
Short introduction & description of the PhD project	In recent years, high-frequency and high-power chips based on such as GaN semiconductors have found extensive applications in the industry. However, along with the rapid increase of the power density of IC chips, "thermal failure" has become one of the major bottlenecks which restrict the further development of power electronics in 5G or aerospace systems. In order to solve this problem, thermal interface materials are commonly applied to bridge the chip and the heat sink for removing excess heat from IC devices. In this potential PhD project, we intend to investigate and overcome two major challenges for using 2D materials (graphene, hBN etc.) as thermally conductive fillers in thermal interface materials: "arrangement adjustment of 2D fillers in the polymer matrix" and "heat transfer enhancement across the interface between the chip and the heat sink", leading to the development of advanced thermal interface materials for electronic packaging.
Contact points	Informal inquiries may be addressed to Prof. Cheng-Te Lin (linzhengde@nimte.ac.cn) and Dr Bo Li (bo.li@nottingham.edu.cn).
PhD topic	**Synthesis of MOF-Derived Dual-Metal M1-M2-N-C Nanocomposites with High-Electrocatalytic Activity for Oxygen Reduction Reaction and Zinc-Air Batteries**
CNITECH Supervisor	Prof. Degao Wang
UNNC Supervisor(s)	Dr. Mengxia Xu
Short introduction & description of the PhD project	Zn-air batteries (ZABs), featuring high theoretical energy density, low cost, high safety, and eco-friendliness, are one of the most promising battery candidates. The performance of ZAB technologies greatly depends on sluggish electrochemical reactions at the cathode, i.e., oxygen reduction reaction (ORR). To increase the utilization of metal catalysts and boost ORR activity, catalyst particle sizes must be significantly reduced. Metal-organic frameworks (MOFs) are a well-known subclass of highly crystalline coordination polymers, which are easily self-assembled by metal nodes combined with organic linkers. Its inherent large specific surface and periodic alternating connection makes MOF an ideal template for the construction of single atom catalysts (SACs). Recently, transition metal-nitrogen-doped carbon (M-N-C) materials derived from MOFs have been emerging as one of the most promising electrocatalysts for ORR. The aim of

	this project is to develop high performance MOF-derived dual-metal M1-M2-N-C catalysts for ORR and ZABs and elucidate the underlying reaction mechanisms wherein.
Contact points	Informal inquiries may be addressed to Dr Mengxia Xu (Mengxia.Xu@nottingham.edu.cn) and Prof Degao Wang (wangdegao@nimte.ac.cn).
PhD topic	**The elastic ferroelectrics with high Cuire temprature based on odd-Nylon**
CNITECH Supervisor	Benlin Hu
UNNC Supervisor(s)	Hao Chen
Short introduction & description of the PhD project	Ferroelectrics are an integral component of the modern world, and of much fascination in electrics, electronics, and biomedicine. However, their usage in emerging wearable electronics is limited by their typical inelastic deformation. Therefore, we developed intrinsically elastic ferroelectrics via combining ferroelectric response and elastic resilience into one material by slight crosslinking of plastic ferroelectric polymers (*Science* **2023**, *381*, 540-544). However, the ferroelectric performance (Curie temperature, remanent polarization, dielectric constant and piezoelectric constant) need further to enhance, so we aim to employ odd-nylon as the substrate to realize the above targets.
Contact points	Informal inquiries may be addressed to Dr. Benlin Hu (hubenlin@nimte.ac.cn) and Dr. Hao Chen (Hao.Chen@nottingham.edu.cn).
PhD topic	**The failure mechanism of ammonia combustion reactor materials**
CNITECH Supervisor	Prof. Zhenlun Song
UNNC Supervisor(s)	Dr Wai Siong CHAI
Short introduction & description of the PhD project	Ammonia has attracted wide interest as a hydrogen alternative in tackling the carbon emissions issues, which also addresses the nation's double carbon goals (carbon peak and carbon neutral). Ammonia mixture combustion has a nitriding effect on the commonly used stainless steel reactor, which makes it fragile, especially as a combustor wall. Such effects are undesirable for gas turbines, particularly for power generation purposes. The material studied in this project aims to resolve the long-term ammonia combustion for power generation purposes as a combustion reactor material. This project will focus on three major dimensions (i) finding a suitable material from existing candidates as an alternative, (ii) improving the material in service by some treatment technologies such as surface coating and (iii) developing a new material for the combustor wall.
Contact points	Informal inquiries may be addressed toDr Wai Siong CHAI (wai-siong.chai@nottingham.edu.cn) and Prof. Zhenlun SONG (songzhenlun@nimte.ac.cn).
PhD topic	**The Investigation of Surface Plasmon Resonance Based on Optical Fiber and Its Application in Biosensing**
CNITECH Supervisor	Prof. Aiguo Wu
UNNC Supervisor(s)	Dr. Jing Wang, Dr. Yong Ren
Short introduction & description of the PhD project	Surface Plasmon Resonance (SPR) has been demonstrated to be the sensing mechanism which outstands in high sensitivity comparing to other sensing mechanisms. SPR delivers a sensitivity up to 10^{-6} RIU which enables the detection of low molecular weight analytes, e.g. viruses, and the detection of analytes with extremely low concentration, e.g. cancer biomarkers. However the relatively narrow dynamic range and its lack of multiplexing capability are still the main challenges for researchers nowadays.

	SPR can be excited in three configurations, i.e. Kretschmann, grating and waveguide. Besides the high sensitivity delivered by SPR, optical fiber, as a type of waveguide, possesses unique advantages in exciting SPR, including:
	1. high stability, as the optical path is completely enclosed within the optical fiber so that the signal is immune to environmental disturbances;
	2. easiness in miniaturization, as the diameter of SM optical fiber is ~125 μm, which is significantly less than the other 2 SPR configurations.
	3. multiplexing flexibility. Combining the microfluidic technique, multiple sections along the optical fiber within the flow cell can be designed to excite SPR, and the multiple sensing units can be designed to enlarge the dynamic range as well as the multiplexing sensing of different analytes simultaneously.
	This project will focus on investigation of the excitation mechanism of SPRs based on optical fiber configuration and its application in healthcare at later stage.
Contact points	Informal inquiries may be addressed to Dr. Jing Wang (Jing.Wang@nottingham.edu.cn) and Prof. Aiguo Wu (Aiguo@nimte.ac.cn).
PhD topic	**The optimization and research of multi-component quantum dot material devices based on CuInS2/CuInSe2, focusing on the ligand and structure of photodiode devices and the optimization of the electron transport side.**
CNITECH Supervisor	Prof. Chaoyu Xiang
UNNC Supervisor(s)	Dr. Jing Wang
Short introduction & description of the PhD project	Colloidal quantum dots ($CuInS_2$ QDs) do not contain toxic heavy metals and have large absorption coefficients in a wide spectral range, and is becoming a new type of quantum dot material that has attracted plenty of attention in recent years. The broad photoluminescence tunability from visible to near-infrared light makes this material a potential for high-quality detectors.
	At present, there are still several major problems in the application of this material in the field of detection. First, the device structure of $CuInS_2$ used in sensing still needs to be optimized, and it is necessary to find a suitable ligand to form an excellent PN junction; second, the current experiments of this quantum dot material data show that its stability is not good, its lifespan is relatively short, and it cannot meet the requirements of industrialization, which still needs to be improved. We try to optimize the performance of the detector by modifying the ligands of the quantum dots and by optimizing the structure of the electron transport side device. The ultimate goal is to make a complete device structure that can be used for optical detection. In the following research, we will introduce the concept of self-assembly, construct a long-range ordered quantum dot structure, and explore methods to control self-assembly, in order to pursue better performance and mechanism of quantum dots.
Contact points	Informal inquiries may be addressed to Prof. Chaoyu Xiang (Xiangchaoyu@nimte.ac.cn) and Dr. Jing Wang (Jing.Wang@nottingham.edu.cn).
PhD topic	**Wastewater treatment membrane system for ammonia production**
CNITECH Supervisor	Prof. Fu LIU
UNNC Supervisor(s)	Dr Wai Siong CHAI

Short introduction & description of the PhD project	Ammonia is one of the most popular energy vectors with its zero carbon properties. The Haber-Bosch process producing ammonia has existed for more than a century and still requires high pressure high temperature condition for operation. The bioelectrochemical or electrochemical wastewater treatment system is anticipated to produce ammonia from the wastewater via environmentally-friendly process. In such system, the membrane has to be integrated for successful ion exchange to occur.
	Based on this background, this project will focus on three dimensions (i) synthesize catalytic membranes and set up the membrane reactor; (ii) test the efficiency of membrane for desired ion exchange; and (iii) perform the lifecycle analysis. The project would contribute to carbon neutrality and point the way for a sustainable future.
Contact points	Informal inquiries may be addressed to and Prof. Fu LIU (fu.liu@nimte.ac.cn) and Dr Wai Siong CHAI (wai-siong.chai@nottingham.edu.cn).