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UNNC – Yongjiang Laboratory Doctoral Training Partnership

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Formal applications should follow the instructions in '[How to apply](#)' section.

Research areas

1. New Material
2. Advanced Manufacturing

Available PhD topics

PhD topic	Breaking material limits: 3D printing of 2D-reinforced metals and ceramics
YLAB Supervisor	Dr. Ruitao SU
UNNC Supervisor(s)	Dr. Ruslan Melentiev
Short introduction & description of the PhD project	<p>Technological progress is ultimately limited by the materials available to us: how they withstand heat, stress, and harsh environments. This PhD project aims pushing our materials limits by developing 3D-printed metals and ceramics reinforced with 2D materials such as graphene and MXenes. These atomically thin reinforcements promise exceptional mechanical, thermal, and electrical performance, yet they are difficult to preserve during high-temperature processing of metals and ceramics. The project will tackle this core materials-science challenge by designing stable 2D–matrix interfaces through controlled chemistry, protective strategies, and tailored sintering atmospheres. Components will be fabricated using sinter-based additive manufacturing, enabling complex geometries in both metals and ceramics. Advanced microscopy and spectroscopy will reveal how 2D materials survive, orient, and interact within dense matrices, while mechanical, thermal, and electrical testing will quantify performance gains. The outcome will be clear composition–process–property relationships and demonstrators of next generation components for energy, electronics, and extreme-environment applications with unparalleled performance.</p>
Contact points	Informal inquiries may be addressed to Dr Ruitao Su (ruitao-su@ylab.ac.cn) and Dr Ruslan Melentiev (ruslan.melentiev@nottingham.edu.cn).
PhD topic	AI-driven precision 3D printing of ceramic materials
YLAB Supervisor	Dr. Ruitao SU
UNNC Supervisor(s)	Dr. Ruslan Melentiev

Short introduction & description of the PhD project	Technical ceramics (e.g. SiC) enable extreme thermal, mechanical, and chemical performance, yet additive manufacturing still struggles with dimensional accuracy, defect control, and chemical purity. This PhD targets AI-enabled ceramic 3D printing that tightly couples green-body printing with sintering. Machine-learning models and physics-based simulations will jointly optimise slurry/powder composition, printing parameters, and thermal profiles to minimise distortion, porosity, and contamination. A key objective is achieving micron-level dimensional fidelity after sintering while reaching $\geq 5N$ chemical purity, without sacrificing productivity. Outcomes include material-processing workflows for precision ceramic AM, scalable design rules for high-purity components, and demonstrator parts for high-temperature electronics, energy systems, and chemical processing.
Contact points	Informal inquiries may be addressed to Dr Ruitao Su (ruitao-su@ylib.ac.cn) and Dr Ruslan Melentiev (ruslan.melentiev@nottingham.edu.cn).
PhD topic	3D printing of glass: from ancient shaping to digital manufacturing with engineered transparency.
YLAB Supervisor	Dr. Ruitao SU
UNNC Supervisor(s)	Dr. Ruslan Melentiev
Short introduction & description of the PhD project	Glass is the hidden enabler of many modern technologies – from smartphone camera lenses and lab-on-a-chip diagnostics to high-power laser optics – yet its shaping remains dominated by ancient manufacturing routes, limiting complex 3D geometries needed. This PhD will enable precision 3D printing of glass to unlock devices that are currently impractical to machine or mold. The central scientific challenge is achieving optical-grade, crack-free transparency in printed glass, because steep thermal gradients create bubbles, crystallisation, and residual stresses that scatter light and trigger fracture. The project will map how composition and thermal history control viscosity, nucleation, stress relaxation, and defect formation, using in-situ monitoring plus post-print heat treatment strategies. Deliverables include process–property “recipes” and demonstrator parts validated for optical performance, chemical durability, and thermal shock resistance among other properties of interest on the optical device market.
Contact points	Informal inquiries may be addressed to Dr Ruslan Melentiev (ruslan.melentiev@nottingham.edu.cn) and Dr Ruitao Su (ruitao-su@ylib.ac.cn)
PhD topic	Photothermal mechanics of thin film materials and devices for advanced spectroscopy
YLAB Supervisor	Dr. Biwei Deng
UNNC Supervisor(s)	Prof. Jian YANG
Short introduction & description of the PhD project	<p>Mid-infrared (IR) spectroscopic imaging, which utilizes inherent vibrational contrast, is widely employed as a powerful analytical tool for sample identification and characterization. However, the thermomechanical response of thin film materials triggered by laser pulses is determined by coupled multiphysics phenomena and hardly resolved in spectroscopic detections. Recently developed Mid-Infrared Photothermal Vibrometry (MIPV) microscopy overcomes this limitation by using visible light to probe the photothermal effect induced by IR absorption. This technique achieves submicrometer spatial resolution with high sensitivity and spectral fidelity.</p> <p>This project will focus on two primary dimensions: (i) nanoscale materials analysis (e.g. semiconductor defect detection and chemical identification of contaminants) and (ii) thermomechanical models of thin film materials (through multiphysics modelling and special substrate design).</p>

Contact points	Informal inquiries may be addressed to Prof. Jian Yang (Jian.Yang@nottingham.edu.cn) and Dr Biwei Deng (biwei-deng@ylab.ac.cn).
PhD topic	Precise control of organoid fabrication and growth via micromanipulation and microfluidics
YLAB Supervisor	Dr. Songlin ZHUANG
UNNC Supervisor(s)	Prof. Jing Li
Short introduction & description of the PhD project	<p>As 3D in vitro models recapitulating human organ structure and function, organoids show great potential for preclinical research, high-throughput drug screening, disease modeling (with clinical translation applications), and mechanistic studies of genetic, infectious, and other diseases. However, their structural complexity and large datasets render conventional analytical methods inefficient and subjective, limiting the capture of dynamic developmental processes and functional heterogeneity.</p> <p>Endowed with high-precision quantification and programmability, intelligent control systems address these challenges via multi-modal data fusion, real-time analysis, and closed-loop regulation—enabling objective organoid profiling and standardized culture optimization. This underscores the need for foundational and technological research on control, sensing, and actuation for organoid models, with the goal of developing specialized devices, integrating automated fabrication and detection, and advancing intelligent biomedical research.</p>
Contact points	Informal inquiries may be addressed to Songlin Zhuang (songlin-zhuang@ylab.ac.cn) and Jing Li (Jing.Li@nottingham.edu.cn).
PhD topic	Hierarchical Integration of Functional Nanomaterials in 3D Micro-Architectures for Advanced Devices
YLAB Supervisor	Dr. Biwei Deng
UNNC Supervisor(s)	Dr. Reza Shoja Razavi
Short introduction & description of the PhD project	<p>This PhD project aims to establish a novel paradigm for creating functional micro-devices by synergistically integrating precision additive manufacturing with advanced nanomaterial synthesis. The research will address the fundamental challenge of hierarchically incorporating functional nanoparticles (e.g., catalytic, plasmonic, or semiconductor) into meticulously designed three-dimensional micro-architectures. The student will employ and bridge two complementary advanced manufacturing techniques: laser-based nanomaterial synthesis for producing tailored nanoparticles with controlled properties, and high-resolution micro-scale 3D printing for fabricating complex device scaffolds. The core scientific work will involve developing and optimizing strategies for the precise spatial integration of nanomaterials within these 3D polymer matrices. The resulting hierarchical nanocomposites will be engineered for enhanced performance in frontier applications such as miniaturized sensors, integrated photonic systems, or catalytic micro-reactors. This interdisciplinary project offers comprehensive training at the intersection of materials science, advanced manufacturing, and functional device engineering.</p>
Contact points	Informal inquiries may be addressed to Dr. Reza Shoja Razavi (Sayed-Reza.Shoja-Razavi@nottingham.edu.cn) and Dr. DENG Biwei (biwei-deng@ylab.ac.cn).
PhD topic	Multi-Scale Mechanics and Energy Transduction of Twist-Enabled Origami Structures via Triboelectric Nanogenerators
YLAB Supervisor	Dr Biwei Deng
UNNC Supervisor(s)	Dr Chung Ket Thein

<p>Short introduction & description of the PhD project</p>	<p>This PhD research investigates the fundamental solid mechanics and multi-scale functional response of twist-enabled origami structures, with particular emphasis on their integration with triboelectric nanogenerator (TENG) mechanisms. Unlike conventional origami systems dominated by folding or bending, this study introduces controlled torsional deformation as the primary kinematic mode, enabling richer deformation pathways and enhanced mechanical–electrical coupling.</p> <p>At the macroscopic scale, the research will examine origami architectures capable of stable and repeatable twisting motion, focusing on geometric topology, crease pattern design, torsional stiffness modulation, and nonlinear deformation behavior. The mechanical response under torsional excitation will be modeled using solid mechanics theory, capturing strain distribution, stress localization, and geometric nonlinearity.</p> <p>At the micro- and meso-scales, the study will explore how material pairing, surface micro-structuring, and contact mechanics govern triboelectric charge generation under twisting-induced contact–separation and sliding. The coupling between torsional deformation and triboelectric energy conversion will be systematically analyzed to establish a mechanics-driven energy transduction framework.</p> <p>A unified multi-scale theoretical model will be developed to link origami geometry, torsional mechanics, and triboelectric output. The theoretical predictions will be experimentally validated through fabricated origami prototypes, combining mechanical characterization and electrical measurements under controlled twisting excitations.</p> <p>The research aims to establish twist-dominated origami mechanics as a new paradigm for multi-scale functional structures, contributing fundamental insights into origami-based solid mechanics while enabling programmable triboelectric energy transduction.</p>
<p>Contact points</p>	<p>Informal inquiries may be addressed to Dr Chung Ket Thein (chungket.thein@nottingham.edu.cn) and Dr Biwei Deng (biwei-deng@ylab.ac.cn).</p>
<p>PhD topic</p>	<p>Nonlinear Multi-Stable Mechanics of Twist-Enabled Origami Structures for Hybrid Energy Transduction</p>
<p>YLAB Supervisor</p>	<p>Dr Biwei Deng</p>
<p>UNNC Supervisor(s)</p>	<p>Dr Chung Ket Thein</p>
<p>Short introduction & description of the PhD project</p>	<p>This PhD research investigates the nonlinear and multi-stable mechanical behavior of twist-enabled origami structures and explores how such behavior can be exploited for hybrid energy transduction. Unlike continuous deformation systems, this study focuses on origami architectures in which torsional deformation and geometric nonlinearity generate multiple stable states, snap-through transitions, and hysteretic responses.</p> <p>From a fundamental solid mechanics perspective, the research will examine how fold topology, torsional stiffness distribution, and material anisotropy give rise to multi-stable energy landscapes. Analytical and reduced-order models will be developed to describe bifurcation conditions, transition thresholds, and state-dependent mechanical responses under twisting excitation.</p> <p>Building on this nonlinear mechanical framework, the study will integrate hybrid energy transduction mechanisms, combining triboelectric nanogenerators (TENGs) with complementary approaches such as piezoelectric or electromagnetic transducers. The objective is to establish a mechanics-guided</p>

	<p>hybrid transduction strategy, where distinct mechanical states and transition events selectively activate different energy conversion modes.</p> <p>Experimental validation will be carried out using twist-enabled origami prototypes, enabling direct correlation between mechanical state transitions and electrical output characteristics. The research aims to establish a new paradigm in which nonlinear origami mechanics is deliberately harnessed, rather than avoided, to enhance robustness, adaptability, and functional diversity in energy transduction systems.</p>
Contact points	Informal inquiries may be addressed to Dr Chung Ket Thein (chungket.thein@nottingham.edu.cn) and Dr Biwei Deng (biwei-deng@ylab.ac.cn).
PhD topic	Mechanical behaviour of optical glass fibres and their composites at the micro/Nano scale
YLAB Supervisor	Dr Biwei Deng
UNNC Supervisor(s)	Prof. Xiaoling LIU
Short introduction & description of the PhD project	<p>Today, glass fiber reinforced composites are widely used in construction, industry, transportation, and communications. In the future, optical fiber-based communication will underpin data transmission, making the glass fiber materials used in optical fibers a core component. However, current optical glass fibers still suffer from inherent brittleness and mechanical fatigue, which limit the advancement of optical fiber communication. To address these issues, this project aims to reduce the brittleness and defects of optical glass fibers, as well as improve their surface morphology quality, through methods such as oxide doping, micro/nano structural design, and micro/nano processing optimization. The project will employ advanced two-photon polymerization lithography, in-situ micro/nano mechanical testing techniques, and multi-scale simulation methods to focus on two core problems: (1) The composition of optical glass fibers (the influence mechanism of dopants on mechanical properties); (2) The surface/interface morphology of optical glass fibers and their composites (the mechanism by which surface/interface morphology affects crack propagation and load transfer).</p>
Contact points	Informal inquiries may be addressed to Dr. Biwei Deng (biwei-deng@ylab.ac.cn) and Prof. Xiaolin LIU (Xiaoling.Liu@nottingham.edu.cn).
PhD topic	Controllable Fabrication of Functional Nanomaterials and Their Cross-Scale Mechanical Behavior
YLAB Supervisor	Dr Biwei Deng
UNNC Supervisor(s)	Prof. Xiaoling LIU
Short introduction & description of the PhD project	<p>Functional nanomaterials show broad application prospects in fields such as energy conversion, flexible electronics, and targeted diagnostics and therapy. However, their insufficient mechanical reliability severely restricts the performance and service life of practical devices. Therefore, developing nanomaterial systems that simultaneously possess excellent functional properties and outstanding mechanical performance has become key to advancing related technologies. This project aims to achieve precise fabrication of functional nanomaterial superstructures via multi-scale structural design combined with 3D printing technology. It seeks to systematically reveal the intrinsic correlation between microstructural features (including grain boundaries, defects, interfaces, etc.) and macroscopic mechanical properties (such as strength, toughness, and fatigue resistance), ultimately enabling the on-demand regulation and enhancement of material mechanical performance. The research will employ controlled preparation methods such as in-situ reaction</p>

	<p>synthesis and interface engineering modification, and will integrate multi-scale characterization and computational techniques including atomic force microscopy, in-situ mechanical testing platforms, and molecular dynamics simulations. The work will focus on addressing two core scientific questions: (1) The mechanism by which fabrication process parameters regulate the material's intrinsic defects and interface structures; (2) How unique deformation behaviors at the micro/nano scale (such as phase transformation, grain boundary sliding, and dislocation motion) influence and determine the macroscopic mechanical response.</p>
Contact points	<p>Informal inquiries may be addressed to Dr. Biwei Deng (biwei-deng@ylab.ac.cn) and Prof. Xiaolin LIU (Xiaoling.Liu@nottingham.edu.cn).</p>
PhD topic	<p>Research on Advanced Multi-Port Solid-State Transformers in Next-Generation Energy Integration Systems</p>
YLAB Supervisor	<p>Dr. Chunyang Gu</p>
UNNC Supervisor(s)	<p>Prof. Giampaolo Buticchi</p>
Short introduction & description of the PhD project	<p>This PhD research proposes the development and comprehensive analysis of a high-performance, modular Multi-Port Solid-State Transformer (MP-SST) architecture. The MP-SST serves as a central power routing and conversion hub, enabling efficient and flexible integration of diverse sources (e.g., renewables, battery storage) and loads (e.g., propulsion systems, avionics) within demanding applications such as renewable energy microgrids and more-electric/all-electric aircraft power distribution networks.</p> <p>The research will establish a detailed multi-physics model of the MP-SST system, incorporating the dynamics of its multi-active-bridge (MAB) converter core, high-frequency isolation transformers, semiconductor devices, and associated passive components. Building upon this model, novel multi-port decoupled power flow control algorithms will be designed and optimized, leveraging techniques such as virtual impedance concepts and advanced phase-shift modulation strategies. These control schemes aim to ensure stable power sharing, precise voltage regulation across multiple DC and/or AC ports, and robust fault management under highly dynamic operating conditions.</p> <p>Furthermore, the research will investigate and optimize soft-switching techniques specifically tailored for the MAB topology within the MP-SST context. This optimization targets the minimization of switching losses, while simultaneously reducing current stress on semiconductor devices to enhance overall system efficiency, power density, and reliability.</p> <p>The proposed research will culminate in the design, simulation, and experimental validation of a scaled MP-SST prototype. The validation will demonstrate its capability to provide galvanic isolation, bidirectional power flow, active power quality management (e.g., harmonic mitigation, voltage sag compensation), and enhanced resilience within complex modern power distribution systems, contributing significantly to the advancement of intelligent power management in renewable integration and electrified transportation.</p>
Contact points	<p>Informal inquiries may be addressed to Prof. Giampaolo Buticchi (Giampaolo.Buticchi@nottingham.edu.cn) and Dr. Chunyang Gu (Chunyang-Gu@ylab.ac.cn)</p>
PhD topic	<p>Advanced Magnetic Integration and Control for High-Density Magnetically Coupled Converters and Motor Drives</p>
YLAB Supervisor	<p>Dr. Chunyang Gu</p>
UNNC Supervisor(s)	<p>Dr. Jing Li</p>

<p>Short introduction & description of the PhD project</p>	<p>This PhD research investigates the design, modelling, and advanced control of highly integrated magnetically coupled power electronic converters specifically for driving propulsion motors. The core objective is to develop compact, efficient, and robust power conversion solutions that meet the stringent weight, volume, reliability, and performance demands of next-generation aviation electrification.</p> <p>The research will focus on:</p> <p>Multi-Physics Modelling: Developing comprehensive electromagnetic-thermal models of advanced magnetically coupled converter topologies (e.g., multi-winding transformers, integrated inductor-converter structures) suitable for high-power-density motor drive applications in transportation. This includes analyzing magnetic saturation, core losses, proximity effects, and thermal management constraints under aviation operating conditions.</p> <p>High-Frequency Magnetics Design: Designing and optimizing magnetic components (transformers, inductors) using novel core materials and winding techniques to achieve ultra-high power density, minimize losses, and ensure reliable operation at elevated switching frequencies.</p> <p>Integrated Power Flow Control: Proposing and analyzing novel control strategies for magnetically coupled multi-port converters (acting as integrated motor drives or power routers) to manage complex power flows between sources (e.g., batteries, generators), the propulsion motor(s), and auxiliary loads. This includes investigating techniques like virtual impedance-based control, adaptive phase-shift modulation, and combined voltage/current regulation schemes for optimal dynamic performance.</p> <p>Prototype Validation: Designing, building, and testing a scaled-down laboratory prototype of a high-density magnetically coupled converter system for an electric propulsion drive application, validating the models and control strategies under realistic operating scenarios.</p> <p>This research will provide critical methodologies and technologies for realizing compact, efficient, and reliable power conversion and motor drive systems, enabling the widespread adoption of electric propulsion in future.</p>
<p>Contact points</p>	<p>Informal inquiries may be addressed to Dr. Jing Li (Jing.Li@nottingham.edu.cn) and Dr. Chunyang Gu (Chunyang-Gu@ylab.ac.cn).</p>
<p>PhD topic</p>	<p>Modelling and Active Mitigation of Switching-Induced Voltage Stress in Motor Windings Driven by SiC MOSFET Power Converters</p>
<p>YLAB Supervisor</p>	<p>Dr. Chunyang Gu</p>
<p>UNNC Supervisor(s)</p>	<p>Dr. Weiduo Zhao</p>
<p>Short introduction & description of the PhD project</p>	<p>Silicon Carbide (SiC) MOSFETs offer significant advantages for electric drive systems, enabling higher switching frequencies and reduced losses, thereby improving power density and efficiency. However, the inherent fast switching transients of SiC devices generate high dv/dt and di/dt, which excite high-frequency resonant circuits formed by parasitic capacitances and inductances within the system. This phenomenon induces severe overvoltage stress across the insulation of motor windings, posing a significant risk of premature failure, particularly in high-performance applications like electric vehicles. While motor windings are the dominant technology for EV traction motors due to their high fill factor and manufacturability, they exhibit unique high-frequency characteristics that make them especially susceptible to these switching-induced voltage stresses. Existing studies often lack comprehensive modelling approaches that accurately capture the complex interaction between the SiC inverter's switching</p>

	<p>behaviour, the high-frequency parasitic network of the power cabling, and the distributed electromagnetic parameters of the motor winding itself.</p> <p>This PhD research aims to develop a multi-physics modelling framework specifically tailored to predict and analyze the transient voltage stress distribution within motor windings driven by state-of-the-art SiC MOSFET inverters. The research will commence with a detailed analysis of the switching transient generation mechanism in the power converter, focusing on the impact of SiC MOSFET switching characteristics (including device parasitics, gate driving strategies, and busbar design) on the generated dv/dt waveforms propagating towards the motor. Subsequently, a high-frequency equivalent circuit model will be developed, incorporating detailed parasitic parameter extraction for the inverter output stage, connecting cable harness, and the motor winding structure. This model will explicitly account for the distributed nature of the winding's turn-to-turn and phase-to-ground capacitances, as well as the frequency-dependent losses. Active mitigation method will be investigated with power converter hardware parameter optimization, modulation and control.</p>
Contact points	Informal inquiries may be addressed to Dr. Weiduo Zhao (Weiduo.Zhao@nottingham.edu.cn) and Dr. Chunyang Gu (Chunyang-Gu@ylab.ac.cn).
PhD topic	Design, Synthesis and Device Fabrication of Deuterated OLED Materials & Organic Optoelectronic Materials
YLAB Supervisor	Prof. Lei Fang
UNNC Supervisor(s)	Prof. Bencan Tang
Short introduction & description of the PhD project	<p>We are currently seeking highly motivated and talented PhD candidates to join our research group, focusing on the frontier field of organic optoelectronic materials and organic light-emitting diodes (OLEDs), with a specific emphasis on the design, synthesis, and device fabrication of deuterated OLED materials. Our group is committed to advancing fundamental research and technological innovation in organic optoelectronics, aiming to bridge the gap between material design and practical device applications.</p> <p>The PhD project will focus on one or more of the following key areas, tailored to the candidate's interests and the group's research priorities:</p> <ul style="list-style-type: none"> •Organic Optoelectronic Materials: design and synthesis of high-performance organic semiconducting materials (including small molecules and polymers) for optoelectronic applications, with a focus on optimizing photophysical, electrochemical, and charge transport properties. •Organic Light-Emitting Diodes (OLEDs): Fabrication, characterization, and performance optimization of OLED devices, including fluorescent, phosphorescent, and thermally activated delayed fluorescence (TADF) OLEDs, targeting high efficiency, long lifetime, and low turn-on voltage. •Deuterated OLED Materials: Innovative design and synthesis of deuterated organic materials for OLED applications. Deuteration, as a powerful strategy to modulate molecular structure and intermolecular interactions, has shown great potential in improving the stability, efficiency, and operational lifetime of OLED devices. The candidate will explore the structure-property relationships of deuterated materials and their performance in OLED devices.
Contact points	Informal inquiries may be addressed to Prof. Bencan Tang (bencan.tang@nottingham.edu.cn) and Prof. Lei FANG (lei-fang@ylab.ac.cn)
PhD topic	Data-driven and artificial intelligence methods for chemical reaction discovery and optimization

YLAB Supervisor	Prof. Bo Song
UNNC Supervisor(s)	Prof. Bencan Tang
Short introduction & description of the PhD project	<p>The discovery and optimisation of chemical reactions underpin advances in pharmaceuticals, materials, and sustainable chemical manufacturing. However, chemical reaction spaces are often vast, highly non-linear, and expensive to explore experimentally, making traditional trial-and-error approaches inefficient and resource-intensive. Recent advances in artificial intelligence (AI), machine learning, and data-driven modelling offer new opportunities to transform how chemical knowledge is generated, enabling faster, more systematic, and more insightful exploration of complex chemical systems.</p> <p>This PhD project aims to develop and apply AI-enabled approaches that tightly integrate machine learning algorithms with chemical experimentation to address fundamental challenges in reaction discovery and optimisation. The project will explore data-efficient algorithms capable of handling multi-objective and multi-constraint chemical problems, where trade-offs between selectivity, productivity, robustness, energy efficiency, and scalability are critical. Particular emphasis will be placed on the development and adaptation of algorithms tailored to chemical data, which are often sparse, noisy, and expensive to obtain.</p> <p>The project will focus on two interrelated dimensions:</p> <p>(i) The development and optimisation of AI and probabilistic algorithms for chemistry, such as Bayesian optimisation, uncertainty-aware learning, and intelligent sampling strategies, designed to guide experimental decision-making under limited data conditions; and</p> <p>(ii) The integration of these algorithms with real chemical reaction systems, enabling closed-loop or human-in-the-loop workflows where AI models actively inform experimental design, prioritise informative experiments, and accelerate chemical insight generation.</p>
Contact points	Informal inquiries may be addressed to Prof. Bencan Tang (bencan.tang@nottingham.edu.cn) and (bo-song@ylab.ac.cn)
PhD topic	Continuous flow chemistry for reaction development, intensification and data-driven optimization
YLAB Supervisor	Prof. Zhenghui Wen
UNNC Supervisor(s)	Prof. Bencan Tang
Short introduction & description of the PhD project	<p>Continuous flow chemistry has emerged as a powerful platform for modern chemical synthesis, offering precise control over reaction parameters such as temperature, pressure, residence time, and mass and heat transfer. Compared with conventional batch processes, flow systems enable rapid mixing, efficient heat dissipation, and access to reaction conditions that are difficult or unsafe to achieve in batch, thereby opening new opportunities for reaction development, intensification, and translation towards industrially relevant processes.</p> <p>This PhD project will explore the use of continuous flow chemistry as an enabling technology for the optimisation and transformation of challenging chemical reactions. By leveraging the intrinsic advantages of flow reactors, the project aims to investigate how reaction conditions can be systematically optimised to improve performance metrics such as yield, selectivity, productivity, and robustness. In particular, the project will examine the integration of machine learning and data-driven methods with flow platforms, where rapid experimentation and high-quality data generation make flow chemistry especially suitable for intelligent reaction optimisation.</p>

	<p>The project will focus on several complementary research dimensions:</p> <p>(i) the development and optimisation of chemical reactions in continuous flow, integrating inline reaction analysis with data-driven and machine learning–assisted approaches to systematically explore reaction parameter spaces and identify robust operating regimes;</p> <p>(ii) the translation of selected synthetically challenging or industrially relevant batch reactions into continuous flow processes, assessing whether flow operation can enable improved safety, efficiency, or scalability;</p> <p>(iii) the exploration of advanced reaction modalities in flow, including electrochemical and photochemical transformations, where continuous operation can offer unique advantages in control, efficiency, and reaction monitoring.</p> <p>In addition, the project will explore opportunities to combine flow chemistry with data-driven optimisation and automation. By integrating machine learning algorithms for reaction analysis and decision-making with continuous flow experimentation, the research may contribute towards closed-loop optimisation workflows. With further advances in automation and robotics, such approaches could form part of longer-term efforts towards increasingly autonomous or self-optimising chemical laboratories, while maintaining a strong focus on fundamental chemical understanding and practical feasibility.</p>
Contact points	<p>Informal inquiries may be addressed to Prof. Bencan Tang (bencan.tang@nottingham.edu.cn) and Prof. Zhenghui WEN (zhenghui-wen@ylab.ac.cn)</p>
PhD topic	High-Efficiency and High-Density Power Converters for Data Centers and Other Emerging AI Applications
YLAB Supervisor	Prof. Giampaolo Buticchi
UNNC Supervisor(s)	Dr. Sheng Zheng
Short introduction & description of the PhD project	<p>The primary challenge in powering AI chips and future data center systems is enhancing the efficiency of Intermediate Bus Converter (IBC) and voltage regulator modules (VRMs) to meet their substantial power demands, driven by the processing of vast amounts of data. This program aims to address key challenges in power solutions for future AI demands, focusing on efficiency, power density, circuit dynamic response and reliability. The research will concentrate on creating novel circuit topologies, system integration approaches, optimizing electronic components, cooling methods and revolutionizing their integration and packaging solutions. Secondly, it is also vital to develop multi-physics models of all relevant components to maximise the performance of the new converter concepts. These models should then be integrated into optimisation procedures for power electronic converter systems in a computationally efficient way to enable comprehensive system efficiency optimizations across a wide range. The program candidate will have the opportunities to validate all the developed models and optimisation results by developing and operating various test setups and prototype systems in collaboration with an industry partner.</p>
Contact points	<p>Informal inquiries may be addressed to Dr. Sheng Zheng (sheng-zheng@ylab.ac.cn) and Prof. Giampaolo Buticchi (Giampaolo.Buticchi@nottingham.edu.cn).</p>

Other potential supervisors

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