UQ Summer Research Project Description

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Project title:	**Bio-valorisation of agricultural waste as Bio-styrofoam**
Project duration:	6 weeks
Description:	Annually in Queensland, 6.87 million tons of agricultural waste are discarded into landfills. This has a double whammy impact of transportation costs and producing a substantial amount of methane, an aggressive greenhouse gas. This project will be conducted in association with La Foundary, a company that has proven, at a small scale, that a viable extracellular polymeric substance (EPS) alternative can be produced from Agrifood waste along with fungi, to be used in the production of bio-based styrofoam. This project will involve testing different raw materials, feed supplements, fungal strains, growing conditions and post processing conditions to optimise the process. The student will also determine the final composite characteristics and product viability for scale-up purposes.
Expected outcomes and deliverables:	Final report and presentation
Suitable for:	Chemical & Bioprocess Engineering students
Primary Supervisor:	Adrian Oehmen
Location/Campus:	St Lucia
Number of Positions:	1
Further info:	

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Project title:	**Enhancing phosphorus recovery from biomass via bio-acidification and chemical precipitation**
Project duration:	6 weeks
Description:	The project focuses on recovering phosphorus (P) from secondary raw materials, specifically activated sewage sludge (i.e., biomass), to support circular economy practices, as P is a critical resource needed for agricultural fertilisers that is being rapidly depleted worldwide. The project is to be conducted in connection with our industrial partner, Incitec Pivot. The student will conduct lab-scale experiments to extract and precipitate P from Enhanced Biological Phosphorus Removal (EBPR) biomass. Initially, optimized bio-acidification conditions, based on previous research, will be tested on new samples to promote high P release in solution. The core of the project will then involve precipitation tests, where various operating parameters such as pH, dosage of calcium hydroxide, nutrient-to-P molar ratio, aging time, and temperature will be adjusted to promote the crystallization of phosphorus as brushite ($CaHPO_4 \cdot 2H_2O$), a valuable fertiliser. The student will acquire practical knowledge in standard laboratory practices, including experiments set up, solution preparation, and chemical analysis, as well as experience in processing and analysing data and reporting results.
Expected outcomes and deliverables:	Expected outcomes: Identification of optimized conditions for maximizing P recovery from EBPR biomass, specifically as brushite. Determination of the key factors influencing both the extraction and precipitation phases. Deliverables: a comprehensive report detailing the project's objectives, methodology, main findings, and potential implications for P recovery within the context of the circular economy.
Suitable for:	*Undergraduate students in chemical engineering and an interest in bioprocess and environmental engineering.*
Primary Supervisor:	*Gaia Boniardi and Adrian Oehmen*
Location/Campus:	St Lucia, Andrew N. Liveris Building
Number of Positions:	1
Further info:	Appropriate training will be provided by the co-supervisor to ensure precision and accuracy in conducting experiments and recording data. The project will offer opportunities to develop time management skills, work both independently and as part of a team, enhance problem-solving abilities, and improve critical thinking and data analysis skills.

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Project title:	**Pyrometallurgical recycling of e-scrap – Project 2**
Project duration:	6 weeks
Description:	Several companies - sponsors of PYROSEARCH are developing processes for recovery of Cu, Pb, Ag, Ni, Sn, Co, etc. during the recycling of e-scrap. Project aim: provide fundamental experimental information and computational tools to predict partitioning of these elements among molten slag, matte and molten metal. Video of Summer Research program 2024: https://youtube.com/shorts/d0wWXLv-CS0
Expected outcomes and deliverables:	Perform 5-10 high-temperature equilibrium experiments aimed at one of the valuable metals (under supervision). Compare equilibrium results with FactSage thermodynamic software and literature Simulative the e-scrap recycling process using FactSage + Excel model template Present the results
Suitable for:	*Chemical/Environmental* *Chemical/Materials,* *Chemical/Metallurgical*
Primary Supervisor:	*Mr. Georgii Khartcyzov*
Location/Campus:	Long Pocket, Banksia Bld 1016
Number of Positions:	1
Further info:	- Specific project will be selected after student interview - In selection process, the preference will be given to students willing to take either Research Assistant or PhD position after graduation

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Project title:	*Characterisation of commercial yogurts: Can structure predict functionality?*
Project duration:	*6 weeks*
Description:	*This project aims to characterise the structure and physical properties of commercial yogurts with varying levels of protein and hydrocolloids. By analysing samples with and without hydrocolloids, the study will investigate how these additives influence protein structure and, in-turn, the solid-like to liquid-like properties of the yoghurt. Advanced techniques, including rheology, microscopy, and spectroscopy, will be utilised to determine the extent to which hydrocolloids affect yogurt properties, providing insights that could inform product development and optimisation of a range of yoghurts.*
Expected outcomes and deliverables:	*Students may gain skills and knowledge in rheology, microstructure and particle properties, data collection and analysis techniques. Results from this project may contribute to a publication. Hence, there may be an opportunity of an authorship or co-authorship of scientific manuscript.* *At the end of the project, students are required to deliver a written report and an oral presentation.*
Suitable for:	*Students with a background in food chemistry, science and technology, chemical engineering, dairy processing. Students who are engaged by industrially relevant real-world applications of fundamental food technology, food and chemical engineering and protein structure.*
Primary Supervisor:	*Dr. Heather Shewan* *Dr. Davor Daniloski*
Location/Campus:	*St. Lucia, The School of Chemical Engineering, The University of Queensland*
Number of Positions:	*1*

UQ Summer Research Project Description

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Project title:	**Critical metals recovery from mine waste and lithium-ion battery waste**
Project duration:	6 weeks
Description:	This project aims to use hydrometallurgical methods to recovery critical metals from mine waste and also the used lithium-ion batteries, supporting sustainable critical metals production. Experimentation will test the effect of acid types, reducing agents, pH, solid loading, reaction time and temperature. This project follows on the previous research projects on synthesis of low-cost adsorbents from mine tailings and clay minerals for critical metal recovery. We aim to conduct proof-of-concept study on synthesis flowsheet and also technical-economic analysis.
Expected outcomes and deliverables:	The student will gain skills in experimental skills in sample synthesis and adsorption test. There will likely be liquid and solid sample characterisation by in-house ICP and XRD. The student will present project outcomes to the hydrometallurgy research group.
Suitable for:	This project is most suited to metallurgical/chemical/environmental engineering students with an interest in the environmental engineering and critical metal recovery.
Primary Supervisor:	Dr Hong Peng (h.peng2@uq.edu.au)
Further info:	If you are interested, please meet with Dr Hong Peng (h.peng2@uq.edu.au) to discuss the project.

UQ Summer Research Project Description

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Project title:	**Understanding the hydrodynamic behaviour of coarse particles in a fluidised bed**
Project duration:	6 weeks
Description:	Mineral processing is highly energy-intensive, with the grinding process consuming the most energy. Reducing energy usage in this process is critical to lowering the CO_2 emissions. One promising approach is to increase the grinding size, which could save energy but present challenges for subsequent processing stages. Traditional equipment in the subsequent processes often struggles to handle coarse particles effectively, leading to performance issues. However, previous research has shown that utilising a fluidised bed structure can enhance the processing of coarse particles, offering a potential solution to this challenge. Hence, following our previous works, this project will investigate the behaviour of coarse particles in a three-phase fluidised bed. This project will utilise advanced technologies including the high-speed camera image analysis and the Focused Beam Reflectance Method (FBRM) to determine the coarse particle motion in situ. The student will also be involved in the hydrodynamic modelling study, which will use the forefront Computational Fluid Dynamic (CFD) to investigate the internal hydrodynamic condition within the fluidised bed. The modelling result will be combined with the experimental result to determine the coarse particle behaviour in the fluidised bed and guide future practice.
Expected outcomes and deliverables:	This project provides a unique opportunity to gain practical research experience, contribute to ongoing sustainability efforts in the industry, and expand skills in both experimental techniques and computational modelling. The student will also have the chance to work with cutting-edge tools like high-speed camera image analysis and the Focused Beam Reflectance Method (FBRM). At the end of the project, the student will deliver a short presentation about the findings from the project.
Suitable for:	This project suits 3rd and 4th year undergraduate students or coursework graduate students majoring in chemical engineering or metallurgy/mechanical engineering.
Primary Supervisor:	Jiarui Chen
Location/Campus:	St Lucia
Number of Positions:	1
Further info:	If you are interested, please contact Jiarui Chen (jiarui.chen@uq.edu.au) to discuss the project.

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Project title:	**Understanding the ultrafine and coarse particles' behaviour in a new mineral processing equipment**
Project duration:	6 weeks
Description:	This project is developed based on a sub-project under the ARC Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals. This large Centre of Excellence is in corporate of eight Australian universities and multiple large mining companies, equipment suppliers and overseas institutes, aiming to resolve the key issues in the mining and mineral processing industry. Currently, the mineral processing industry is urging the ability to process ultrafine and coarse mineral particles. However, the traditional equipment performed poorly when processing those ultrafine and coarse particles. Our previous works showed that a newly developed equipment has the potential to resolve this issue. Therefore, this summer research project will follow our previous works to investigate how the ultrafine and coarse particles will perform in this new equipment. The student will learn the operation of this new equipment and perform the laboratory experiment. By utilising the Focused Beam Reflectance Method (FBRM), the distribution of the ultrafine and coarse particles in the equipment will be determined. The student will also be involved in the hydrodynamic modelling study, which will use the forefront Computational Fluid Dynamic (CFD) to investigate the internal hydrodynamic condition within the equipment. Combining the lab experiment result and the modelling result, we could reveal the behaviour of fine and coarse particles in this new equipment.
Expected outcomes and deliverables:	The student will gain the skills for mineral processing experiments and be familiarised with the advanced characteristic methods including the FBRM, ICP and XRD. The student will also have an understanding of how to model the internal hydrodynamic via the CFD simulation. A short presentation will be given by the student at the end of the project.
Suitable for:	This project suits 3rd and 4th year undergraduate students or coursework graduate students majoring in chemical engineering or metallurgy/mechanical engineering.
Primary Supervisor:	Jiarui Chen
Location/Campus:	St Lucia
Number of Positions:	1
Further info:	If you are interested, please contact Jiarui Chen (jiarui.chen@uq.edu.au) to discuss the project.

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Project title:	**Processing of critical minerals**
Project duration:	6 weeks *On-site*
Description:	The student will work on sustainable production of critical minerals, which is supported by an Australian Research Council Linkage grant. We will develop and demonstrate a new process to improve concentration and recovery of critical minerals at reduced costs and environmental burden.
Expected outcomes and deliverables:	The student may gain skills in mineral processing technologies and have an opportunity to generate publications from the research.
Suitable for:	This project is open to applications from students with a background in chemistry or chemical / metallurgical engineering, 3rd-4th year students only.
Primary Supervisor:	Liguang Wang
Location/Campus:	St Lucia
Number of Positions:	1
Further info:	

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Project title:	**Green method optimization for bioplastic recovery from halophilic microorganisms**
Project duration:	6 weeks
Description:	Polyhydroxyalkanoates (PHAs) are plastics that present attractive mechanical properties for numerous industry applications, and have the benefit of being biodegradable in the environment. The wide production and application of PHAs is currently constrained by the relatively high cost compared with conventional plastics. Among all, PHA extraction and recovery from the bioproduction culture is considered as a high-cost process. This project considers the use of green extraction method, including osmotic shock and/or green chemicals, to extract PHA from the microbial cells. This technology may be able to lower the production costs of PHA substantially, making it more competitive in the market with cheaper, non-biodegradable petroleum-based plastics. The project examines how bioplastic downstream process parameters, such as time, temperature, solid:liquid ratio, and pH, impact PHA extraction in order to optimise the PHA recovery process. Particularly, osmotic shock method will be focused, where halophilic cells can be ruptured using fresh water to extract the bioplastic from cells. The student will get experience with extraction vessel operation, process design and optimisation, and the recovery of microbial cells and the extraction of bioplastics through circular economy approaches.
Expected outcomes and deliverables:	The student will learn how to conduct an applied research project and appreciate the challenges and perspectives associated with industry-focussed research. Key deliverables are: - At least one presentation to the relevant audiences. - A final report for the summer research project summarising the outcome from laboratory experiment and a high-level cost analysis to compare the methods from this project to the literature reports.
Suitable for:	Chemical engineering, Chemical+Bioprocess engineering and Chemical+Environmental engineering UQ students
Primary Supervisor:	Lisa Bai and Adrian Oehmen
Location/Campus:	St Lucia
Number of Positions:	2
Further info:	x.bai@uq.edu.au, a.oehmen@uq.edu.au

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Project title:	**Computational Fluid Dynamics analysis of Fluidic Cell Culture Devices**
Project duration:	6 weeks
Description:	The endothelial cells that line our blood vessels are constantly exposed to blood flow-induced mechanical forces, which is implicated in several cardiovascular diseases. In developing *in vitro* arterial models to study these diseases, the BMSE lab is currently using fluidic cell culture systems to investigate the effect of these forces on endothelial cell behaviour. The aim of this student project is to analyse the mechanical forces acting on cells through these fluidic systems using computational fluid dynamics (CFD).
Expected outcomes and deliverables:	Programs such as ANSYS will be used for performing CFD analyses to analyse key factors such as wall shear stress (WSS) and the oscillatory shear index (OSI). This will include investigating how these results change when exposed to steady flow, pulsatile flow, and a flow regime resembling the cardiac waveform. Students must already have demonstrated experience in CFD and will have the opportunity to apply these skills to cardiovascular research. Students will also provide an oral presentation at the end of their project summarising their outcomes.
Suitable for:	Mechanical engineering students with existing experience in computational fluid dynamics, as demonstrated through a brief interview.
Primary Supervisor:	Dr Mark Allenby
Location/Campus:	St Lucia, Andrew N. Liveris Building (46)
Number of Positions:	1
Further info:	

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Project title:	**Catalysts design for carbon utilisation and emission reduction**
Project duration:	6 weeks
Description:	This project aims to develop novel catalysts for underutilised carbon upgradation and reduce the carbon emission via heterogenous process. The anticipated goal is to develop technologies to deliver value-added products via full exploitation of carbon and reduce the carbon emission, or other related parts (such as hydrogen metallurgy) for iron and steel making sectors.
Expected outcomes and deliverables:	Scholars will learn the basic principle for heterogenous catalyst design, including catalysts preparation, advanced characterization and catalysts evaluation. This interdisciplinary project will enable the participants gain knowledge in establishing a circular economy with sustained development. An oral presentation may be produced at the end of the summer research.
Suitable for:	This project is open to applications from students with background in chemistry, chemical engineering, environmental engineering, material science and Metallurgical engineering, 3rd - 4th year and graduate students.
Primary Supervisor:	Dr Ping Chen
Location/Campus:	St Lucia campus
Number of Positions:	1
Further info:	Prefer to be contacted by students prior to submitting an application

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Project title:	**Oral Process Engineering of Plant-Based Meats**
Project duration:	6 weeks; ~30 hours/week; lab-based
Description:	The number of plant-based meat products on the market has grown recently in response to increasing need and consumer concern for the environmental and ethical issues associated with the meat industry. Additionally, plant-based meats are *perceived* as a healthy alternative to meat. However, reproducing the sensory experience of eating meat remains a challenge. To enhance consumer acceptance and facilitate continued growth of the market, it is vital to develop innovations that add value to current products and design new products with desirable sensory properties. Oral processing encompasses the first bite into a food and the subsequent comminution, bolus formation, swallowing, and aftertaste of a food. The development of new techniques to measure the physical properties of meat analogues *throughout* the oral process may provide additional markers for the rational and targeted design of future plant-based meat products.
Expected outcomes and deliverables:	Students will be asked to produce a report at the end of their project. This report may be used to generate a research article.
Suitable for:	This project is suitable for students with a background or interest in food engineering.
Primary Supervisor:	Dr Rebecca Forster
Location/Campus:	St Lucia
Number of Positions:	1
Further info:	rebecca.forster@uq.edu.au

IUQ Summer Research Project Description

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Project title:	**Improving metal and mineral extraction using radicals produced from advanced oxidation processes (AOP)**
Project duration:	6 weeks (between 13 of January and 21 of February, 2025)
Description:	In traditional mineral leaching, the conventional oxidants cannot generate a high electrochemical potential to efficiently liberate valuable metals (such as gold, silver, copper, etc) from waste rocks. Hence, this Australian Research Council (ARC) linkage project, funded by Newmont Corporation (USA), BHP (Australia) and the Australian Government, aims to develop a new oxidation pathway to improve the extraction of precious, base and rare-earth metals. Unlike traditional oxidants, inorganic radicals with at least one unpair electron are highly reactive. These radicals typically have a strong oxidising ability, which may be able to substitute for the traditional oxidants used in mineral leaching to improve metal extraction. In this summer project, the successful candidate will identify and quantify the radicals produced by advanced oxidation processes (AOP) through techniques such as electrochemical studies and/or electron paramagnetic resonance (EPR) spectroscopy in a leaching system.
Expected outcomes and deliverables:	*In this project, the student will gain knowledge of the advanced oxidation processes (AOP), a new technology rapidly developed in various industries, including wastewater treatment, metal extraction and medicine. The student will also get a taste of applied research, in which the industrial needs highly drive the work in the laboratory. The findings from this project may be used to optimise radical production during the commercialisation. The student will be expected to produce a report and an oral presentation to summarise their work during this project. The findings of this work have a strong potential to generate publications. Additionally, the student may also have the opportunity to present their findings to our international and domestic industry partners.*
Suitable for:	*This project is suitable for engineering student who* • *Is entering or in their 4th or 5th year in their undergraduate studies with a major in chemical engineering discipline* • *Is undertaking master studies by coursework* • *with a strong academic background, especially in inorganic chemistry* • *has an interest or is considering a thesis project or higher degree by research (PhD degree) in the future*
Primary Supervisor:	*Richard Lee*
Location/Campus:	Andrew Liveris Building (46)/St Lucia
Number of Positions:	1
Further info:	Please contact Richard Lee (lijie.lee@uq.edu.au) for discussion before applying

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Project title:	**Investigating the electrochemical interaction during mineral processing of iron oxide deposits**
Project duration:	6 weeks (between 13 of January and 21 of February, 2025)
Description:	In mineral processing, many sulphide minerals carrying valuable metals (such as copper, nickel, gold, silver, lead, zinc etc.) are separated from waste rocks through the comminution process followed by froth flotation. It was observed that the mineral flotation performance can be affected by the presence of iron oxides (hematite and magnetite) in the deposit, posing challenges to the operation. It is hypothesised that the electrochemical interaction between different materials and iron oxide during the comminution and froth flotation process may play a key role. To help improve the processing of base and precious metals hosted in iron oxide-sulphide deposit, this project is established to understand the electrochemical interactions during the grinding of iron oxide-containing ore. The student will quantify the strength of different galvanic couples formed when processing iron oxide-containing ores via electrochemical studies. The findings may serve as a piece of critical information to explain the shift in plant operation due to the presence of hematite and magnetite.
Expected outcomes and deliverables:	*In this project, the student will gain knowledge of electrochemistry and corrosion science, which are the fundamentals of battery industries and material science. The findings from this work may be used for the solution development at flotation concentrators that process iron oxide deposits and have a strong potential to generate publications. Additionally, the student may also have the opportunity to present their findings to our international and domestic industry partners participating in this Australian Research Council Linkage Project.*
Suitable for:	*This project is suitable for engineering student who* • *Is entering or in their 4th or 5th year in their undergraduate studies with a major in chemical engineering discipline* • *Is undertaking master studies by coursework* • *with a strong academic background, especially in chemistry/electrochemistry* • *has an interest or is considering a thesis project or higher degree by research (PhD degree) in the future*
Primary Supervisor:	*Richard Lee*
Location/Campus:	Andrew Liveris Building (46)/St Lucia
Number of Positions:	1
Further info:	Please contact Richard Lee (lijie.lee@uq.edu.au) for further discussion

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Project title:	Manufacturing stem cells for therapeutic applications
Project duration:	6 weeks
Description:	The inability to generate large numbers of high-quality stem cells prevents their widespread use in biomedical applications. The sector needs methods that enhance manufacturing quality and consistency at a reduced cost. Our approach aims to develop and test cell culture media additives with proven cell manufacturing properties. We hypothesise that stabilising growth factors used to grow stem cells will sustain growth signals and reduce the need for excess use of expensive additives that adversely affect cell quality.
Expected outcomes and deliverables:	Students will gain hands-on experience growing and handling stem cells, the ability to change stem cell fate, and involvement in a dynamic research team working on improving health outcomes. At the end of their project, students may also be asked to produce a short report or oral presentation.
Suitable for:	*Students interested in Cell Therapy Manufacturing*
Primary Supervisor:	*Prof Simon Cool*
Location/Campus:	Level 8 Andrew Liveris Building
Number of Positions:	2
Further info:	https://about.uq.edu.au/experts/34187

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Project title:	**Small Scale gasification of green waste – tailored nature positive outcomes or too small to make a difference?**
Project duration:	6 weeks
Description:	Invasive plant species are causing significant havoc to local ecosystems. Their removal is frequently not cost effective and underprioritized as a result. We seek to understand if small scale removal and transformation of this waste into valuable liquid/gaseous fuels can be made economic through innovative process flowsheets and new technologies. The project will also look to establish what value of nature positive credits would make such technologies economic. We will examine supply chain logistics, on-site removal and transformation as well as conversion at centralised council facilities.
Expected outcomes and deliverables:	*Process flowsheets and process economics of waste transformation at a variety of scales* *Report & Presentation of findings*
Suitable for:	*4th and 5th chemical engineers preferred. Strong process modelling skills required*
Primary Supervisor:	*Simon Smart*
Location/Campus:	Andrew N Liveris, St Lucia
Number of Positions:	1
Further info:	s.smart@uq.edu.au

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Project title:	**Data gathering for CO2 Electrolyser Performance**
Project duration:	6 weeks
Description:	CO2 Electrolysis is a new frontier for the chemical industry. Significant amounts of research have been published in the last decade, with a justifiable focus on performance improvement and more valuable products. This project seeks to catalogue this research (in the academic and patent literature), identify and record the relevant parameters for both performance and testing protocols into a centralised database. We also seek to develop data entry tools for researchers to report new findings (and quickly benchmark) internally within the GetCO2 Centre of Excellence. Finally we seek to develop powerful visualisation tools that may better indicate data trends or performance outliers which may give clues to further performance enhancements.
Expected outcomes and deliverables:	*Database for CO2 electrolyser performance / products* *Widget for new data entry* *Visualisation tools* *Report & Presentation of findings*
Suitable for:	*Year 3+ engineers preferred* *Data / IT encouraged to apply*
Primary Supervisor:	*Simon Smart*
Location/Campus:	Andrew N Liveris, St Lucia
Number of Positions:	2
Further info:	s.smart@uq.edu.au

Lab or Hazardous Materials induction required: ☐ Level 1 Lab Manager - Michael Murphy ☐ Level 5 Lab Manager - Chris Plackowski ☐ Level 6 Lab Manager – Julia Lackenby ☐ Level 7 Lab Manager - Cheryl Berquist ☐ Level 8 Lab Manager - Julia/Aaron ☐ Level 9 Lab Manager - Aaron Seow	Please insert yes or no and which is required and with which manager, please tick: NO

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Project title:	**Electrolyser Market Survey**
Project duration:	6 weeks
Description:	Electrolysis is a new frontier for the chemical industry. Hydrogen is leading the way but CO2 electrolysis and other production routes are emerging. Significant amounts of research have been published in the last decade, with a justifiable focus on performance improvement and more valuable products. With new manufacturers of electrolysers and electrolyser components emerging daily it is important for researchers to stay up to date with current trends. This project seeks to audit global electrolyser suppliers and their associated supply chains – who are they, what do they make, how does it perform and what components do they use and who makes the components?
Expected outcomes and deliverables:	*Database for CO2 electrolyser performance / products / components* *Report & Presentation of findings*
Suitable for:	*Year 3+ engineers preferred*
Primary Supervisor:	*Simon Smart*
Location/Campus:	Andrew N Liveris, St Lucia
Number of Positions:	2
Further info:	s.smart@uq.edu.au

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Project title:	**Biomethane Storage – a viable option for long term energy storage or green hype**
Project duration:	6 weeks
Description:	The role of biomethane in the energy transition is uncertain. Electrification appears the most cost effective pathway for residential, commercial and some industry consumers of natural gas to decarbonise. However, the long-term storage of biomethane or synthetic natural gas produced from waste sources has not been adequately studied. We seek to understand if the seasonal variability in biomethane production and seasonal variation in gas demand can be better optimised through the use of long-term, large scale biomethane storage in centralised hubs.
Expected outcomes and deliverables:	*Process flowsheets and process economics of biomethane production / storage pathways* *Report & Presentation of findings*
Suitable for:	*4th and 5th chemical engineers preferred. Strong process modelling skills required*
Primary Supervisor:	*Simon Smart*
Location/Campus:	Andrew N Liveris, St Lucia
Number of Positions:	1
Further info:	s.smart@uq.edu.au

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Project title:	Separation of sulphur from pyrite concentrate.
Project duration:	6 weeks
Description:	The biggest application of sulphur is in producing sulphuric acid, and it is also required for advanced batteries, pharmaceuticals, and in producing fertilizers. In Australia, some prospective metal production facilities along with other important industries are limited because of the high cost of sulphuric acid. A local technology capable of generating sulphur would therefore enable critical metals and other producers to be established. Several technologies, such as producing soluble sulphates from sulphur, converting S to hydrogen sulphide gas, or making S vapour etc are potential approaches to remove sulphur, but the question remains as to how to best recover elemental sulphur, to maximise the sustainability. This project will focus on separation of sulphur from pyrite concentrate, using hydrometallurgical route.
Expected outcomes and deliverables:	The applicant will have the opportunity to learn- a) laboratory skills and hands-on experiences in a well-established hydrometallurgy lab. b) Data collection and analysis. c) Writing a report. d) Oral presentation. e) Opportunity to publish a paper.
Suitable for:	Applicants with interests in chemistry and extractive metallurgy are encouraged to apply.
Primary Supervisor:	Dr Ummul Sultana
Location/Campus:	The location will be the Banksia Building (1016) in Long Pocket campus of UQ.
Number of Positions:	1
Further info:	-

UQ Summer Research Project Description

Please use this template to create a description of each research project, eligibility requirements and expected deliverables. Project details can then be uploaded to each faculty, school, institute, and centre webpage prior to the launch of the program. **Please note all fields must be completed.**

Project title:	**Pyrometallurgical recycling of e-scrap – Project 2**
Project duration:	6 weeks
Description:	Several companies - sponsors of PYROSEARCH are developing processes for recovery of Cu, Pb, Ag, Ni, Sn, Co, etc. during the recycling of e-scrap. Project aim: provide fundamental experimental information and computational tools to predict partitioning of these elements among molten slag, matte and molten metal. Video of Summer Research program 2024: https://youtube.com/shorts/d0wWXLv-CS0
Expected outcomes and deliverables:	Perform 5-10 high-temperature equilibrium experiments aimed at one of the valuable metals (under supervision). Compare equilibrium results with FactSage thermodynamic software and literature Simulative the e-scrap recycling process using FactSage + Excel model template Present the results
Suitable for:	*Chemical/Environmental* *Chemical/Materials,* *Chemical/Metallurgical*
Primary Supervisor:	*Dr. Xi Rui Wen*
Location/Campus:	Long Pocket, Banksia Bld 1016
Number of Positions:	1
Further info:	- Specific project will be selected after student interview - In selection process, the preference will be given to students willing to take either Research Assistant or PhD position after graduation

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Project title:	**Foaming and interfacial properties of plant-based milks**
Project duration:	6 weeks
Description:	Plant-based milk, derived from sources like almonds, soy, and oats, is increasingly popular as a dairy alternative. Its applications span from beverages to baking, cooking, and use in coffee and tea. When it comes to foaming, crucial for cappuccino-style drinks, whipped cream, and ice cream, the foamability and foam stability determines the overall product quality. Literature has shown that the composition of the plant-based milk, foaming techniques, milk processing conditions, the presence of surfactants can affect the foaming properties and yet the underlying mechanisms are poorly understood. The student will observe the foaming behaviours and rheological properties of plant-based milk and study the influence caused by alterations in plant-based milk composition and foaming method.
Expected outcomes and deliverables:	Students may gain knowledge/skill in concepts/measurement of emulsion design, rheology and foaming. A written report and an oral presentation are required at the end of the project. Results from this project may contribute or partly contribute to a publication and opportunity of authorship or co-authorship. Student will attend weekly meetings with their supervisors.
Suitable for:	This project is suitable for 2nd to 4th year undergraduate student or course work post-graduate student majoring in Chemistry, Chemical Engineering or its varieties. It is expected that undergraduate applicants have finished all compulsory courses listed for their program up to the year of their study.
Primary Supervisor:	Dr. Yuan Xu and Ms Shuting Xu
Location/Campus:	St. Lucia
Number of Positions:	1
Further info:	For further information, please contact Shuting Xu (uqsxu14@uq.edu.au)

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Project title:	**Green hydrogen production with champion photocatalysts**
Project duration:	6 weeks
Description:	Green hydrogen production is Australian's top priority in the action towards decarbonization. Photocatalytic water splitting represents as the long-term strategic technology for low cost, low emission green hydrogen generation pathway. Current research target on liquid water splitting on solid photocatalyst particles, which produces a great gas diffusion barrier during the hydrogen and oxygen evolution. To solve this problem, we intend to develop a triple-phase interfaces via the innovation in photocatalysts bed. A porous gas diffusion layer will be applied to investigate the feasibility of this idea with the champion photocatalysts provided by the prestigious expert in Japan. Through this project, we aim to achieve a fast and easy managed photocatalytic reaction system.
Expected outcomes and deliverables:	Expected outcomes: 1. The most exciting research frontier about photocatalytic water splitting 2. An innovation design for the next generation photocatalytic reactors with potential patents 3. Largely inspiring the research field with potential publications 4. The students will access the skills in data collection, gas chromatograph operation, reactor assembling and world class mentorship and facilities operation.
Suitable for:	*Year 3-4 students*
Primary Supervisor:	*Zhiliang Wang*
Location/Campus:	St Lucia
Number of Positions:	3
Further info:	Feel free to email me via zhiliang.wang@uq.edu.au

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Project title:	Development of Ion Exchange Membranes for Energy-Related Applications
Project duration:	6 weeks
Description:	Ion exchange membranes (IEMs) are a distinctive category of semi-permselective membranes worth up to 1000-2000 AUD per square meter, approximately 100 times higher than conventional desalination membranes. As charge conductors and reactant separators, they serve as the key components in plenty of energy-related implementations, spanning from H_2 production from water splitting, CO_2 electrochemical reduction, fuel cells, and flow batteries. Driven by the ever-increasing of energy consumption resulting from human activities, the world is projected to witness a concurrently increasing need for IEMs with a compound annual growth rate (CAGR) of 9.5% in the coming decade. Given IEMs are still in their nascent stage of development, the huge demand and high price will incentivize emerging academic research and industry commercialization opportunities.
Expected outcomes and deliverables:	*Reliable protocol for the membrane fabrication* *Lab based membrane testing and optimization*
Suitable for:	*Master student*
Primary Supervisor:	*Xiwang Zhang, and Zhuyuan Wang*
Location/Campus:	St Lucia campus
Number of Positions:	1
Further info:	