Research Title
Green Synthesis of Multifunctional Carbon Dots from Agricultural Waste

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr. Tan Huey Ling
Contact Number:	014-2212616
Email Address:	hueyling@uitm.edu.my
Area of Expertise:	Nanotechnology/ Materials/ Waste Valorization
Grant Availability:	Yes
Vacancy:	MSc/PhD
Requirement	1) Open to all Nationality 2) Interested in research and willing to learn new laboratory techniques 3) Full time 4) Allowance: RM 1500 (MSc) RM 2200 (PhD)

Summary of the potential project:

Nanomaterials possess unique chemical and physical properties that make them desirable to use in many products. Carbon dots (CDs), which are small carbon nanoparticles (less than 10 nm in size) with interesting optical properties. In this work, hydrothermal treatment of agricultural waste for preparing carbon dots (CDs) will be used. Optical and structural properties of the CDs will be studied and surface functionality and composition of the CDs will be further characterised. CDs will be developed to value added product.

UiTM di hatiku

Research Title

Adsorption/ desorption mechanism of modified 'terpolymer of acrylic acid, 2-acrylamido-2-methylpropane sulfonic acid' polymeric inhibitor (AA/AMPS)/ carbon nanoparticles (CNPs) in silicate scale squeeze treatment inhibition

UNIVERSITI TEKNOLOGI MARA

Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr Rozana Azrina Sazali
Contact Number:	011-21538586
Email Address:	rozana592@uitm.edu.my
Area of Expertise:	Flow Assurance in oil and gas production - Scale
Grant Availability:	Yes
Vacancy:	MSc (Full Time)
Requirement	1) Open to all Nationality 2) Bachelor in Petroleum Engineering/ Bachelor in Chemistry/Bachelor in Chemical Engineering 3) Well verse in handling and analysis of spectroscopy instrument is an advantage 4) This research is industrial-driven problem. You will have the opportunity to collaborate with respective player in oil and gas industry. 5) Allowance: RM 1200 – RM 1500

Summary of the potential project:

Alkaline surfactant polymer (ASP) floods in sandstone reservoirs are associated with silicate scaling of production wells. One of the approaches in managing this scale is by applying SI down hole to production wells via continuous injection line. However, it involved a high dose of chemical (250-500 ppm) and research had shown that none of scale inhibitors (SI) deployed can totally inhibit this scale from occurring.

Therefore, it is vital to enhance the squeeze treatment program by 'modifying' scale inhibitor (A5) with nanoparticles i.e. the carbon nanoparticles (CNPs) will help to prolong the squeeze lifetime with much lower minimum inhibitor concentration (MIC) of inhibitor deployed. In this project, CNPs is introduced to enhance the delivery of A5 (i.e. placement) and/or to assist in the "binding" of A5 to the rock surfaces.

The objectives of this research are (i) to study the adsorption of A5 onto CNPs and the rock formation; (ii) to determine the inhibition efficiency of A5/CNPs formulation in inhibiting silicate scale; and (iii) to characterize the produced silicate scale precipitation in the presence of A5/CNPs blends.

The adsorption of A5 on the CNPs and the A5/CNPs inhibition efficiency is quantified as a function of time whereby the characterization of silicate scale formed in the presence of A5/CNPs blends and its efficiency will be carried out by SEM, XRD, FTIR studies.

It is expected that a good dispersion of CNPs in the chemical blend can increase the adsorption of A5 on the rock surfaces due to the exposure of the higher surface area to A5 which consequently could mitigate the silicate scale deposition.

New developed A5/CNPs to be deployed in squeeze treatment is a significant discovery in resolving the silicate scale problem in ASP fields in the most economical way i.e. much lower MIC and longer squeeze lifetime.

Research Title
Synthesis of unsupported mesoporous nickel-cobaltites for thermo-catalytic decomposition of biomethane

UNIVERSITI TEKNOLOGI MARA | Fakulti Kejuruteraan Kimia

Researcher's Name:	Nor Faeqah Idris
Contact Number:	0125631964
Email Address:	norfaeqah@salam.uitm.edu.my
Area of Expertise:	Reaction Engineering
Grant Availability:	Yes
Vacancy:	MSc
Requirement	1) Malaysian 2) Degree in Chemical Engineering/ Environmental Engineering/ Industrial Chemical Technology 3) Full time 4) Allowance: RM 1800

UiTM di hatiku

Summary of the potential project:

Carbon nanomaterials are generally synthesized by carbon arc discharge and laser ablation methods which is low yield in carbon, as low as 30 wt%. Thus, decomposition of biomethane is a new promising method to improve the nanocarbon yield. However, currently, the decomposition of biomethane is conducted at high temperature above 1200°C, which posed a risk towards safety and operational cos t . Therefore, heterogeneous unsupported mesoporous nickel-cobaltites will be investigated in this study via a facile coprecipitation method to alleviate high reaction temperature in biomethane decomposition. Furthermore, the kinetics and mechanisms study on unsupported catalyst for biomethane decomposition is rarely reported. Nickel-cobaltites unsupported catalyst will be prepared using ammonium carbonate as a precipitating agent via co-precipitation method. The as-prepared nickel-cobaltites will be characterized by using X-Ray diffraction, energy dispersive X-ray spectroscopy, scanning and transmission electron microscopy, Xray photoelectronspectroscopy, N2 adsorption and temperature programmed reduction analysis. The catalytic performance of the catalysts is evaluated for biomethane decomposition at various reaction temperatures and the properties of reaction temperature dependent nanocarbon will be investigated in detail. The effect of reaction temperature on the crystalline, morphological and

graphitization properties of the deposited nanocarbon will be studied as well. The NiCo2O4 catalyst is expected to be highly pure phase and porous, and the yield of carbon nanotube is expected to be increased. The significance of this research is the development of new low cost nickel-cobaltites unsupported catalyst for biomethane decomposition at low reaction temperature, the study of catalyst kinetic mechanism and the investigation of carbon temperature-dependent properties.

Research Title
Hybrid membrane development for sequestration and biocatalytic reduction of CO2

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr Fauziah Marpani
Contact Number:	018-2013401
Email Address:	fauziah176@uitm.edu.my
Area of Expertise:	Biocatalytic membrane Enzyme technology Membrane separation
Grant Availability:	Yes
Vacancy:	PhD
Requirement	1) Open to all Nationality 2) MSc (Chemical Engineering) or related 3) Allowance: RM 2300 4) Good command in English 5) Additional remuneration based on performance 6) Full time

Summary of the potential project:

Development of polymer based membrane for sequestration, hydration and biocatalytic reduction of carbon dioxide into other chemical precursors.

UiTM di hatiku

Research Title
Assessment of Plant-based Surfactant on activated carbon derived from wastes for adsorptive properties

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	Ir. Normadyzah Ahmad
Contact Number:	013-3401108
Email Address:	normadyzah@uitm.edu.my
Area of Expertise:	Separation technology
Grant Availability:	Yes
Vacancy:	Research Assistant (RA)
Requirement	1) Malaysian only 2) BEng/BSc with CGPA>2.80 (Chemical Engineering/Chemistry) 3) Allowance: RM 500 4) Interested in research and willing to learn new laboratory techniques.

Summary of the potential project:

Activated carbon has been widely used for adsorption of contaminants in waste water. However, its surface is highly hydrophobic and has little surface charge thereby reducing its adsorption capacity for anionic and cationic contaminants. In this study, plant based surfactant is impregnated onto activated carbon derived from various types of wastes to assess their adsorptive properties.

UiTM di hatiku

Research Title
Elucidation of Solvents and Additive on Hydrogen Bond Network of urea

UNIVERSITI TEKNOLOGI MARA | Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr Siti Nurul' Ain Binti Yusop
Contact Number:	019-6052904
Email Address:	sitinurul'ain@uitm.edu.my
Area of Expertise:	Crystallisation
Grant Availability:	Yes
Vacancy:	MSc
Requirement	1) Open to all nationality 2) Bachelor of Chemical Engineering/Chemistry or any related fields 3) Allowance: Yes 4) Interested in research and willing to learn new laboratory techniques.

Summary of the potential project:

Crystallisation is a separation process of solid crystals formed in solution. The quality of crystals is very dependent on parameters such as solvents, supersaturation, temperature, cooling rates, and pH. In the pharmaceutical industry, the morphology of drugs crystals needs to be controlled to ensure the drug's performance. Different solvents used for crystallisation might produce different morphology, and the addition of additive may help to produced better crystal shape. It is because of different molecular interactions exist between drugs molecule and the solvents or additive. The objectives of the work are to evaluate urea morphology crystallised in different solvents and additive and to assess the molecular interactions specifically hydrogen bonding network between urea and solvents or additive molecules. Urea is selected as a material to be studied because of the hygroscopicity and polarity of the molecule. It can be used as an Active Pharmaceutical Ingredient (API) for dermatological drugs application and as fertiliser. It has long needle-like shape with polar and non-polar facets. The needle-like shape is not recommended as it is difficult to handle in downstream formulation process due to easy breakage and it will give impact to powder flowability. The polarity difference between two facets makes it interesting to understand the molecular interactions of these facets with the effect of solvents and additive, hydrogen bonding, specifically. Crystallisation of urea in different types of solvents will be conducted to observe the morphology of crystals, as well as the morphology prediction. Molecular modelling on crystal growth of urea has been established, however, to understand the molecular interactions of the hydrogen bonding network should be assessed in depth. Therefore, molecular dynamic simulation will be used to explain this situation in molecular level.

Research Title
Green Synthesis of Flexible Biopolymer Materials

UNIVERSITI TEKNOLOGI MARA | Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr Ana Najwa Mustapa
Contact Number:	012-3678154
Email Address:	anajwa@uitm.edu.my
Area of Expertise:	Separation Processes, Materials and Environment
Grant Availability:	Yes
Vacancy:	MSc (Full time)
Requirement	1) Open to all nationality 2) Minimum CGPA > 2.75 3) Allowance: RM 1500 4) Interested and willing to learn new laboratory techniques, good ability to face challenges, creative, good interpersonal and communications skills. 5) Willing to do Research Attachment in Universidad de Valladolid, Spain. Research materials, travelling cost and fee for attending conference and seminar will be sponsored.

Summary of the potential project:

Hydrogel is defined as three-dimensional network structures obtained from a class of synthetic and/or biopolymers. The gels are usually obtained by drying wet gels using freeze and ambient atmospheric drying. Nevertheless, these technique causes collapsed on most part of the pore volume. As consequences, the dried gels appear wrinkled-like, severely crack and possessing very poor surface area, porosity, light and visibility properties. These limitations may reduce process development efficiency, for example drugs loading and delivery, optical transparency and catalytic activity. A unique properties of CO2 at supercritical condition i.e. high diffusivity, low viscosity and zero surface tension can be exploited as the most feasible drying technology to produce aerogels without damaging the original three-dimensional structure of the gels and improve their physical/chemical properties. In this study, a new hybrid biopolymer aerogels made of a hybridization of organic materials will be synthesized and dried by supercritical CO2. The physical and chemical properties of the synthesized hybrid aerogels will be examined and compared to other ordinary methods i.e. freeze and ambient atmospheric drying. Investigation on the physical-chemical, textural and thermal properties of the new hybrid aerogels are significant in emerging new functional materials. In addition, study on the principle of new drying technology i.e. supercritical drying in production of biopolymer-based hybrid aerogels is foreseen could embark and motivate further application of the technology comprehensively in other fields such as food packaging, electronics, cleaning, catalyst, pharmaceuticals and biomedical.

Research Title
Development of Metal–Organic Framework (MOF) Membrane-based Calorimetric Sensor for Detection of Toxic Metal Ions

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr. Nur Hidayati Othman
Contact Number:	011-23515139
Email Address:	nurhidayati0955@uitm.edu.my
Area of Expertise:	Membrane separation technology, Adsorption, Functional nanomaterials, Graphene-based materials
Grant Availability:	Yes
Vacancy:	MSc
Requirement	1) Open to all Nationality 2) Bachelor Degree 3) Interested in research and willing to learn new laboratory techniques 4) Full time 5) Allowance: RM 1200- RM 1500

UiTM di hatiku

Summary of the potential project:

Heavy metals are typically detected and quantified using sophisticated analytical equipment. Many efforts have been made to develop portable heavy metals detection unit such as colorimetric sensor and optical sensor due to their naked-eye recognition nature. Pyridine and thiol are actively used as active probe molecules for the detector but it has limited sensitivity and low detection range(20-100nM of metal ions concentrations) due to weak stimuli response. Thus, these materials can be functionalised with mesaporous materials to rapidly trap heavy metal. Functionalisation with metal organic framework (MOF) is expected to improve the sensitivity and detection rate of heavy metals due to uniform and large framework pore structure of MOF. Cheap polymeric membrane will be used as a substrate to support the active probe molecules. As the properties of membrane substrate and dip coating parameters play a significant role in producing thin and homogeneous deposition of active probe molecules layer, the effects both factors need investigated simultaneously.

Research Title
Development of nanophotothermal membrane for desalination

UNIVERSITI TEKNOLOGI MARA | Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr. Nur Hidayati Othman
Contact Number:	011-23515139
Email Address:	nurhidayati0955@uitm.edu.my
Area of Expertise:	Membrane separation technology, Adsorption, Functional nanomaterials, Graphene-based materials
Grant Availability:	No
Vacancy:	PhD
Requirement	1) Open to all Nationality 2) Bachelor Degree / Master 3) Interested in research and willing to learn new laboratory techniques 4) Full time

Summary of the potential project:

Currently, there is a crucial need to convert non-potable sources such as seawater or brackish water to suitable water for human consumption. Nevertheless, energy requirement to operate desalination plant accounts for half from its operating cost. Hence, low energy approaches such as membrane distillation has shown potential as it could operate at low operating temperature and pressure. In this research a nanohybrid photothermal membrane distillation system, where a localized photothermal heating induced by solar will be developed. The photothermal nanomaterials with multifunctional properties will first be synthesized before integrating the materials onto membranes via dip-coating technique. The performance of nanophotothermal membrane distillation will then be evaluated using bench-scale setup

UiTM di hatiku

UNIVERSITI TEKNOLOGI MARA | Fakulti Kejuruteraan Kimia

Research Title
Emulsion Liquid Membrane for Wastewater Treatment

Researcher's Name:	Meor Muhammad Hafiz Shah Buddin
Contact Number:	017-3986316
Email Address:	meorhafiz7767@uitm.edu.my
Area of Expertise:	Membrane Technology
Grant Availability:	Yes
Vacancy:	MSc
Requirement	1) Malaysian Only 2) Degree in Chemical Engineering 3) Able to work smart and independently 4) Full time 5) Allowance: RM 1300

Summary of the potential project:

Emulsion Liquid Membrane (ELM) is a double emulsion system where the primary emulsion consists of internal (water) and membrane (oil) phase. The primary emulsion is then dispersed in the external (water) phase to extract the targeted solute with the aid of carrier in the membrane phase. The research is intended to explore the utilization of ELM to remove contaminant from wastewater. Hypothetically, ELM able to serve as an excellent alternative for solute removal from aqueous solution due to its characteristics; high surface area to volume ratio, single unit of operation, fast extraction and low cost.

UiTM di hatiku

Universiti Teknologi Mara | Fakulti Kejuruteraan Kimia

Research Title
Synthesize of Zirconia from Zircon Malaysia Sand

Researcher's Name:	Dr. Istikamah Subuki
Contact Number:	+603-55436537
Email Address:	istikamah@uitm.edu.my
Area of Expertise:	Injection Moulding, Hydroxyapatite, Composite, Synthesize of Zirconia
Grant Availability:	No
Vacancy:	MSc
Requirement	Full time

Summary of the potential project:

Synthesize monoclinic zirconia powder by caustic fusion method for dentistry application

UiTM di hatiku

Research Title
Advanced/Conventional Transesterification of plant oil from Elais Guineensis to biodiesel

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	Amizon Azizan
Contact Number:	019-5167240
Email Address:	mijonmy@gmail.com
Area of Expertise:	Oxygen transfer rate in shake flask, Liquid distribution in shake flask, biofuel
Grant Availability:	No
Vacancy:	MSc
Requirement	1) Open to all Nationality 2) Fresh graduate is welcome 3) Full time/part time 4) In search of grant, otherwise, own start up

Summary of the potential project:

To use the palm potential due the abundance and future prospect for exports of biodiesel to the world market.

UiTM di hatiku

Research Title
Synergistic effect during microwave pyrolysis of food waste towards combustibility of biochar and bio-fuel using microwave pyrolysis technique

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	PM Dr Siti Shawalliah Idris
Contact Number:	012-3882579
Email Address:	shawal075@uitm.edu.my, shawal_idris@yahoo.com
Area of Expertise:	Waste to wealth, renewable energy
Grant Availability:	No
Vacancy:	PhD (Full Time)
Requirement	1) Open to all Nationality 2) MSc by research in relevant area. ** If student is interested in doing MSc, preferable obtained BEng in Chemical Engineering. 3) Familiar with modelling and experimentation and instrumental analysis 4) Equipment is readily available

Summary of the potential project:

This research work concerns about investigating the conversion of food waste to bio charcoal as fuel source. Microwave pyrolysis of food waste is complex process due to the dependency of the process over numerous parameters namely mass/volume input, composition, moisture content, temperature profile, dielectric properties, power level and products yield. The products obtained namely bio charcoal will be characterised and analysed for the combustibility analysis. The model of the microwave pyrolysis food waste is necessary in order to represent the physical system under various parameters, continuous and different operation conditions. It is expected the model developed will be able to predict the yield of products under various conditions and able to improve the nonuniform temperature profiles within food waste. An experimentation investigation of the above parameters and its modelling will be performed to determine the performance of bio charcoal produced as renewable energy source.

Research Title
CO2 Capture, CO2 Conversion, Reactive separation

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	Dr Fauziah Marpani
Contact Number:	018-2013401
Email Address:	fauziah176@uitm.edu.my
Area of Expertise:	Biocatalytic membrane Enzyme technology
Grant Availability:	Yes
Vacancy:	MSc (Full Time)
Requirement	1) Open to all Nationality 2) BSc Chemical Engineering, with CGPA at least 2.85 3) Allowance: RM 1200- RM 1500 (depending on performance) 4) Critical thinking, fluent english writing, honest, discipline 5) Lab work will be conducted only maximum 8 months intensively, chances of graduating on time. Remuneration will be given based on quality of paper published.

Summary of the potential project:

Enzymatic catalysis in membrane in the application of CO2 capture and direct conversion

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Research Title
Mechanism of Clay Minerals Conductivity Diminution Using Hydroxide Solution

Researcher's Name:	Wan Zairani Wan bakar
Contact Number:	019-2636695
Email Address:	zairani@uitm.edu.my
Area of Expertise:	Petroleum Engineering/electrochemical
Grant Availability:	Yes
Vacancy:	MSc (Full Time)
Requirement	1) Open to all Nationality 2) Bsc or B.Eng with CGPA 3.0 and above in Petroleum Engineering/Chemical Engineering/Chemistry/Physics or related disciplines. 3) Allowance: RM 1500 4) Good English command

Summary of the potential project:

Previous studies had reported that cation exchange capacity (CEC) of clay minerals (in powder form) can be reduced via hydroxide precipitation. The CEC is directly related to clay minerals conductivity. In this research we will investigate the mechanism of conductivity diminution on shaly sand plug (contain clay minerals) by means of CEC reduction using different hydroxide formulations.

UiTM di hatiku

Research Title
Demulsification Mechanism Study of Water in Oil Emulsion using Biopolymer Nanocrystal

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Researcher's Name:	'Aqilah Dollah
Contact Number:	012-7624411
Email Address:	aqilah7097@uitm.edu.my
Area of Expertise:	Advanced Material, Production
Grant Availability:	Yes
Vacancy:	MSc (Full Time)
Requirement	1) Malaysian Only 2) Bachelor in Oil & Gas Engineering/Chemical Engineering/Chemistry or any related fields. 3) Allowance: RM 1800 4) Able to work with & without supervision

UiTM di hatiku

Summary of the potential project:

Emulsion creates problems during oil production, transportation and treatment thus affect the operation costly. Toxicity and vulnerability of chemical demulsifiers gradually increase environmental and concerns. Hence, ethyl cellulose nanocrystal, a biodegradable polymer demulsifier had been proposed to reduce such problem. However, the study of this biopolymer nanocrystal to destabilize the water-oil emulsion is sparsely reported. Besides the conventional acid hydrolysis used to extract nanocellulose usually generates high acid waste water. Therefore, this research will focus on understanding the mechanism of ethyl-nanocellulose to improve water-oil demulsification mechanism in an environmentally friendly way. The objectives of this research are to synthesize and characterize ethyl-nanocellulose with ionic liquid of BmimCl, to evaluate the performance of ethyl-nanocellulose in the water-in-oil emulsion demulsification and to investigate adsorption mechanism of ethyl-nanocellulose for water-in-oil emulsion. The experiment will be commence with the synthesis ethyl-nanocellulose with ionic liquid BmimCl at different concentration, reaction temperature and time. The ethyl-nanocellulose obtained will be characterized for its morphology, physical, chemical and thermal properties for better understanding in method development. The optimum extraction of ethyl-nanocellulose results from ionic liquid will be evaluated for water-in-oil demulsification at different ethyl-nanocellulose concentration and emulsion water cut. The concentration of ethyl NC that give highest separation rate will be further evaluated on the adsorption mechanism in water-in-oil demulsification. The effect of surface morphology, wettability and adsorption process on liquid-liquid interactions will be attained. As output, this project will provide clear understanding on the adsorption mechanism of ethyl-nanocellulose toward water-in-oil emulsion. The impact of the knowledge will be beneficial in reducing toxicity and pollution throughout the oil transportation and demulsification process. The output is to support the idea of green technology and sustainability that become one of the Sustainable Growth Development for clean water sanctuary in oil and gas production process and National Nanotechnology Council of Malaysia.

UNIVERSITI TEKNOLOGI MARA
Fakulti Kejuruteraan Kimia

Research Title
Supramolecular glycosides for energy conversion applications

Researcher's Name:	Nurul Fadhilah Kamalul Aripin
Contact Number:	016-3244833
Email Address:	fadhilah9413@uitm.edu.my
Area of Expertise:	Liquid crystal polymer
Grant Availability:	Yes
Vacancy:	PhD (Full Time)
Requirement	1) Open to all nationality 2) Master degree preferably in Chemistry 3) Posses good organic synthesis skill and conduct good research ethics.

Summary of the potential project:

The project aims to prepare new electrolytes containing liquid crystal carbohydrates, LCCs and functional polymer capable to increase the efficiency of energy conversion devices and sensors. The purpose is to solve crossover phenomena faced by the existing electrolyte used in the direct methanol fuel cell which consequently reducing its performance. The proposed material is envisaged to provide alternative solution by preventing/reducing crossover via controlled morphologies with enhanced anisotropic conductivity.

UiTM di hatiku

UNIVERSITI TEKNOLOGI MARA | Fakulti Kejuruteraan Kimia

Research Title
Investigation of liquid crystal block copolymers effect on proton transport phenomena of low temperature fuel cell membrane

Researcher's Name:	Nurul Fadhilah Kamalul Aripin
Contact Number:	016-3244833
Email Address:	fadhilah9413@uitm.edu.my
Area of Expertise:	Liquid crystal polymer
Grant Availability:	Yes
Vacancy:	MSc (Full Time)
Requirement	1) Malaysian Only 2) Bachelor degree 3) Good laboratory skills and practice great research ethics

Summary of the potential project:

Low temperature fuel cells are a promising technology for renewable and environmental-friendly power source due to their noteworthy features including low operating temperature, high power density and easy scale-up. This research will be conducted by synthesizing liquid crystal (LC) block copolymers membranes using reversible addition-fragmentation chain transfer (RAFT) polymerization. It is expected that LC will control and improve the formation of the phase separated domain and thus enhance the proton transport phenomena in low temperature fuel cell membranes. The insights gained from this proposed work will contribute to a new and versatile concept of membrane preparation and new materials for low temperature membranes which has potential to be applied in renewable power source applications.

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