BioPRIA NEWSLETTER

March 2024

BioPRIA Monthly Seminar Series

In mid-February we welcomed back Prof Florent Allais to BioPRIA!
Florent presented at our February BioPRIA Monthly Seminar Series on "Valorizing biomass at URD ABI: case studies" to an audience of over 40 delegates including industry, academics and PhD candidates.

The two hour run seminar included presentations and discussion by PhD students Hans Cainglet on the "High Contrast Analysis of Cellulose Nanofibril Film Structure and Barrier Properties" while Darsan Haridas presented his research on "Transition metal catalysed functionalisation of nanocellulose"

PhD Visitor from Monash Malaysia

In Nov-Dec 2023, Janice Leong, a PhD student from Monash University Malaysia, visited BioPRIA for a month under the host supervision of Assoc Prof. Warren Batchelor. Her research focuses on modelling the morphology distribution of cellulose nanocrystals during acid hydrolysis. The goal of her visit was to learn about the synthesis and characterization of cellulose nanocrystals in order to gain practical insights for the development of her model. During her visit, she worked with Dr. Christine Browne on the synthesis of cellulose nanocrystals via sulfuric acid hydrolysis and size characterization using the atomic force microscopy.

“The visit was fruitful as I gained significant knowledge on how cellulose nanocrystals are synthesized and characterized. This provided me with a better understanding and the factors to consider for the model. The discussions with BioPRIA researchers also gave fresh perspectives to incorporate into the model. I established new connections at BioPRIA and am grateful for the visit opportunity to BioPRIA.”

Conference Highlight

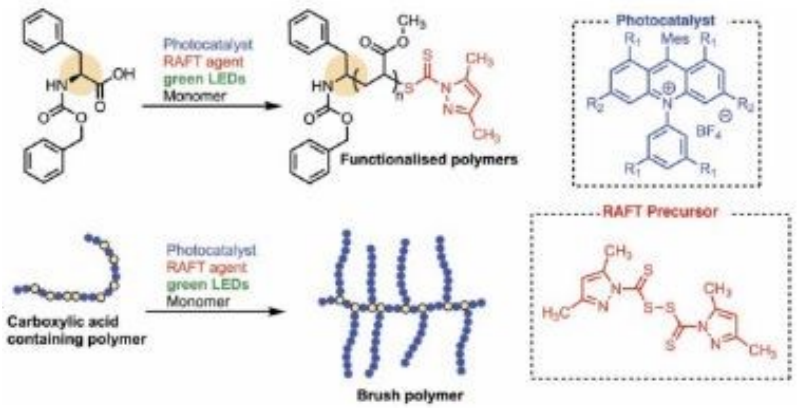
PhD candidate, Sara Barricella, had the honour of representing BioPRIA at the prestigious American Chemical Society (ACS) Spring Conference, which took place in New Orleans (Louisiana), from March 17th to 21st this year. ACS conferences are known for bringing together chemists and professionals from various disciplines to share scientific advancements in various chemistry sectors. This gathering offered an excellent platform for Sara to express her enthusiasm for chemistry, engage in networking, and establish professional connections. A remarkable moment of the conference was the motivational lecture delivered by Nobel Laureate Carolyn Bertozzi. Sara showcased her research on enzymatic cascade reactions in ultrafiltration membranes in the Colloids and Surface Chemistry Division.

Sara had also the opportunity to collaborate with her co-supervisor, Professor Benny D. Freeman, at the University of Texas in Austin. During her visit there, she engaged in a collaborative research project with Mostafa Nasser and zanna Ivandic, investigating the reduction in cut-off diameter in nanofiltration membranes following the deposition f enzymes and polydopamine, which will provide insight into the effect of polydopamine layering on membrane performances.

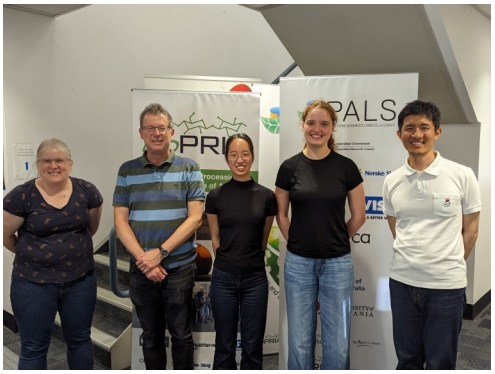
RAFT paper by Joel Hooper highlighted in Issue of Chemistry Australia

Congratulations to Dr Joel Hooper's RAFT paper which was highlighted in the March issue of Chemistry Australia.

Many advanced applications of polymer science require polymers to be covalently attached (or grafted) to other molecules, materials or surfaces. This is often a multistep process, as the target for grafting must first be modified to include particular functional groups that can then initiate the polymerisation. In a new approach from the Hooper research group at Monash University, reversible addition–fragmentation chain-transfer (RAFT) polymers were grafted in a single step from small molecules and polymers through a photochemical radical decarboxylation reaction (Ayurini M., Haridas D., Mendoza D.J., Garnier G., Hooper J.F. Angew. Chem. Int. Ed. 2024, 63, e202317071). The method uses an organic photocatalyst and green light to generate radicals via the decarboxylation of carboxylic acid functional groups on the target molecules. This radical is then intercepted by a RAFT precursor agent, which allows for controlled radical polymerisation driven by light. Given the ubiquity of carboxylic acids in bioactive small molecules, biopolymers and synthetic polymers, this approach offers the ability to synthesise a host of functionalised polymer materials in a simple and efficient manner.



Summer Research Project Highlight by Phoebe Maloney and Ashley Ting



BioPRIA accepted two new summer research students, engaging in research activities from November 2023 through till February 2024. Phoebe worked under the supervision of A/Prof. Warren Batchelor and Dr Christine Brown, investigating the sprayability of nanocellulose for industrial applications. She thoroughly enjoyed working under such enthusiastic supervisors and was grateful for the opportunity to learn what a future in research might look like.

"I really enjoyed my time at BioPRIA, everyone was really nice and approachable. Getting to see all the talented academics research topics that interested them was very inspiring and definitely something to strive towards".

Ashley worked under the supervision of A/Prof. Warren Batchelor and PhD student Yasuaki Inoue, investigating the surface charge modification of lignin nanoparticles and potential applications. She particularly enjoyed the autonomy and freedom of research, as well as the dual lab and office environment.

"I was very grateful for the opportunity to work with such driven and dedicated researchers, and admired their passion for pushing the boundaries of existing knowledge. Thanks to a great support team at BioPRIA, I immensely enjoyed my time working there." As part of their research endeavours, the two students created a 3MT-style video, poster presentations and participated in a research group seminar to share their findings.

Congratulations to our PhD Students

We extend our congratulations to Rahul , Pallabi and Gloria who recently completed their PhDs:

- Dr Rahul Sharma–"Functionalised Cellulosic Materials". Supervisors Assoc Prof Victoria Haritos and Prof Gil Garnier

-Dr Pallabi Sinha Roy " Designing Functional Polymers and Materials from Ligninderived Molecules". Supervisors Prof Tony Patti, Prof Gil Garnier, Prof Florent Allais and Prof Kei Saito

- Dr Gloria Diaz Arenas " Membrane separation and characterisation of bio-sourced xylooligosaccharides " . Supervisors Dr Joanne Tanner, Prof Gil Garnier and Dr Muhammad Munir Sadiq.

We wish them all the very best of success in their future endeavours.

Welcome to BioPRIA

We are pleased to welcome two new PhD candidates, Asifa Nadeem and Dawood Fazal to the BioPRIA team.

Asifa's research project focusses on **PEI-grafted Cellulose nanofibrils (CNFs-PEI) polymer based Aerogel for drug delivery system**s under the supervision of Prof Gil Garnier and Assoc Prof John Quinn.

Dawood is working on ***Synthesis of Renewable Cellulosic Nanofibers for Sustainable Packaging Applications*** under the supervision of Assoc Prof Warren Batchelor and Prof Gil Garnier.

Latest Publications

Bourgery, C , Mendoza, D. J., Garnier, G. , Mouterde, L.M.M ., Allais, F.2024. **Immobilization of Adenosine Derivatives onto Cellulose Nanocrystals via Click Chemistry for Biocatalysis Applications** *ACS Appl. Mater. Interfaces* 2024, 16, 9, 11315–11323 DOI: 10.1021/acsami.3c19025

Stocker, C.W., Wong, V.N.L., Patti, A.F. *et al.* **Effect of lignin in cellulose nanofibers on biodegradation and seed germination**. *Chem. Biol. Technol. Agric.* **11**, 15 (2024). DOI: 10.1186/s40538-023-00528-y

Ayurini, M., Haridas, D., Mendoza, D. J., Garnier, G., & Hooper, J. F. (2024**). RAFT Polymerisation by the Radical Decarboxylation of Carboxylic Acids**. *Angewandte Chemie International Edition*, *63*(4), e202317071.

Mendoza, D.J., Nasiri, N., Duffin, R.N., Raghuwanshi, V.,Mata, J., Simon, G.P., Hooper, J>F>, Garnier, G., 2024.**Multifunctional graft-IPN hydrogels of cellulose nanofibers and poly (N-isopropyl acrylamide) via silver-promoted decarboxylative radical polymerizati** . DOI:10.1016/j.mtchem.2024.102014

Sharma, R., Putera, K.H., Banaszak Holl, M.M. *et al.* **Solvent-free cellulose fatty amide synthesis aided by enzymatic oxidation.** *Cellulose* **31**, 765–776 (2024). DOI: 10.1007/s10570-023-05688-6

Nadeem, H., Nimmegeers, P., Batchelor, W., & Billen, P. (2024). **Cellulose nanofibre films as a substitute for plastic packaging: a comparative environmental life cycle assessment.** *Food and Bioproducts Processing*. DOI: 10.1016/j.fbp.2024.03.005

Tiong, A. Y., Crawford, S., Jones, N. C., McKinley, G., Batchelor, W., & van't Hag, L. (2024). **Pea and soy protein isolate fractal gels: the role of protein composition, structure and solubility on their gelation behaviour**. *Food Structure*, 100374. DOI: 10.1016/j.foostr.2024.100374

Vijay, P., Raghuwanshi, V. S., Ma, J., Batchelor, W., & Saito, K. (2024). **Fenton-like oxidation of pinewood to produce cellulose nanoparticles in one pot treatment**. *Cellulose*, *31*(2), 953-967. DOI:10.1007/s10570-023-05573-2

Sanchez-Salvador, JL; Monte, MC; Negro, C; Batchelor, W; Garnier, G; Blanco, A **Dataset for facilitating the calculation of aspect ratio of fibrillated cellulose suspensions based on gel point data** Elsevier DOI: 10.1016/j.dib.2023.109944

Farewell to Colleagues

We farewelled David Mendoza at the end of 2023. David was a PhD student at BioPRIA under the supervision of Prof Gil Garnier and Prof George Simon. Upon his completion he became a Research Fellow at BioPRIA under the supervision of Prof Gil Garnier.

After 14 years at BioPRIA, we farewelled Scot Sharman at the end of March. Scot is currently studying for his Certificate 4 in Work, Health and Safety.

Congratulations to Christine Browne who commences a new position with Defence in early May. Christine worked as a Postdoc for five years under the supervision of Prof Gil Garnier and Assoc Prof Warren Batchelor.

We thank David, Scot and Christine for all their support and help during their time at BioPRIA. Wishing you all the best and success in your new endeavours.

Conferences of Interest

Chemeca 2024: Lead the Change Gold Coast, Queensland, 29 September– 1 October 2024
Register here

CONTACT BIOPRIA
Bioresource Processing Research Institute of Australia (BioPRIA)
Department of Chemical and Biological Engineering
15 Alliance Lane (Building 59), Clayton Campus
Monash University Victoria
Tel: (03) 9905 3456
Fax: (03) 99053413

www.biopria.com.au
linkedin.com/company/biopria
@biopria5249