

Pulp Digest



Community Newsletter

January–April 2020

Issue #1



Issue #1, 2020

4

Message from PPC's new Director

6

The Problem with Recycling Paper Cups

9

Grad Achievements

10

Introductions - New staff at PPC

11

BioAlliance Initiatives

Design and production:

Chitra Arcot

PPC's Communication Coordinator

Pulp Digest

Our community newsletter

Pulp Digest

Our community newsletter

12

Covid-19 and UBC–PPC's responses

13

PPC Laboratory Updates

15

Our Student and Researcher Community

18

Publications in Peer-reviewed Journals

On the front cover

Christina Moreno, ERMP co-op student, is working on the glycolysis reaction of soft foam material to produce a polyol. The reactor is made of a 5-L round bottom glass, a motor and mixing rod, a condenser, and a thermocouple. The reaction is done by combining a 50% w/w solvent mixture with soft foam to recycled foam.

What's the buzz about?

PPC's
Director



Dr. Orlando Rojas
PPC's New Director

1 January 2020

Director's Message

A new year and a new beginning as I relocated from Finland, after accepting my appointment at UBC as Canada Excellence Research Chair in Bioproducts. In this role, one of my missions is to deliver next-generation materials from renewable, forest-based resources. Sustainable and cost-competitive advanced materials are key for the success of the bioeconomy and the reinvention of the Canadian forest industry. For this purpose, and as the new Director of the UBC's Pulp and Paper Centre and the Bioproducts Institute, my immediate attention relates to our people. Faculty members, researchers and supporting staff are key contributors of the PPC mission.

Our research teams work on aspects to uncover solutions that nature may provide to fulfill our material needs. Resources that we find around us, including wood, agricultural waste and marine residues are core to our research and for society's sustainable use. Some of our work deals with small objects (colloids), including fibres and particles. Forest products continue to be central in our efforts and collaborations with industry. Work towards the adoption of nanomaterials and enabling nanotechnologies will also continue. Related efforts take advantage of the inherent ability of biomolecules to assemble into fibres and other highly hierarchical and multidimensional structures. Lignin, cellulose nanoparticles and the possibility to control their assembly in hydrogels, aerogels, foams and emulsions are subjects of current interest in our quest to develop functional properties. They offer promise in future applications. Some examples relate to passive and active components in advanced functional materials that will expand the use of plant fibres.

What does this augur for the Pulp and Paper Centre (PPC)? We look forward to making best use of our know-how, infrastructure and resources available at PPC, with the active involvement of many collaborators around campus and beyond. Plans are already in motion to establish key partnership and strategies, to review lab space and upgrades. We are making way for new, advanced instrumentation, and welcoming new users. The months ahead will see people engaged on their research, in newly refurbished labs and in a very cohesive atmosphere.

PPC can look forward to new researchers joining their ranks from other parts of the world. All of us are a part of the ongoing work to accomplish our dreams following sustainable goals.

The present and the future carry much promise. Our responsibilities are directed to its fulfillment.



Orlando Rojas

Daniela Alejandra Figueroa Vargas

Coffee is the number one food service beverage in Canada. According to a non-profit organization Zero Waste Canada, 14 billion cups of coffee are consumed every year and a 35 percent is consumed “to go” in single-use cups, resulting in 4.9 billion of cups as a major pollution hazard. While theoretically, paper cups can be recycled, most facilities choose not to do so, because of the technical difficulties of separating the cups’ plastic lining from the paper. Instead, cups usually end up in landfills or in the environment. In our research, we assess the potential of high-consistency refining technology in the recycling process of paper cups. A benefit of recycling over composting is that the high quality, long cellulose fibres are captured and reused in other paper applications.



Figure 1. Starting material



Figure 2. George and Reanna operating HC refiner in PPC lab.



Figure 3. Separated and dried plastic liner of a single cup

The Problem with Recycling Paper Cups

The Problem with Recycling Paper Cups: Our Approach

Refined material after HC refining

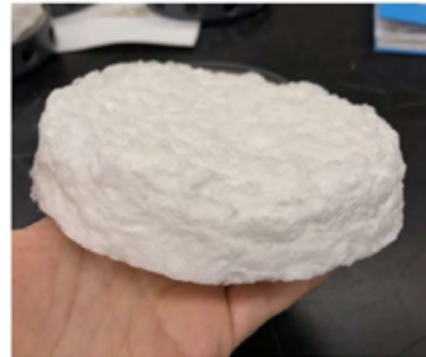
83% pulp yield after screening

17% rejects after screening



Recycled cellulose fibres can be used for high-grade paper applications, similar to those of hardwood fibres.

Can we use rejects for foam forming technology?



Our approach involves the initial refining of standard paper cups to a “fluffy” material combining cellulose fibres and small plastic particles. In the next step, this fluff goes through a screening to separate the plastic polyethylene (PE) lining from the valuable long fibres. Our initial assessment showed that the plastic PE lining content equals to only seven percent of the whole cup which illustrates the significance of

recovering the remaining 93 percent of cellulose fibres. After screening, the resulting pulp fibre yield was 83 percent, suggesting that the reject stream still contains some cellulose fibres strongly entangled together with the PE lining. Our future experimental work focuses on the chemical and physical characterization of both streams by understanding their mechanical potential, and thereby defining the best industrial applications.

Interview with Daniela



1. Who are the researchers involved in this project?
The research team consists of Christina Moreno (Co-op student), Daniela Vargas Figueroa and Reza Korehei, and is led by principal investigator Professor James Olson.
2. How long is this project to last?
This is a one-year project, and its funding comes from the Kuwait Foundation for the Advancement of Sciences (KFAS) in Kuwait.
3. What do you hope will be your outcomes from this project? Publish a paper, for instance?
We hope to develop a better understanding of recycling technologies and assess the potential of other problematic materials. We are also planning to share our findings by publishing our research in the near future.

Grad Achievements

Co-op undergrad, **Zehong John Li**

Publication (in press)

- Arian Ebneyamini, Jun Young Kim, Zezhong John Li, John R. Grace C. Jim Lim, and Naoko Ellis. "Concentrated Calcination for Calcium-Looping Carbon Capture: Compatibilities and Limitations". *Journal of Industrial and Engineering Chemistry*, 2020 (in press). (www.sciencedirect.com/science/article/pii/S1226086X20301301)

Conference presentation:

- Zezhong John Li, Arian Ebneyamini, Jun Young Kim, John R. Grace, Naoko Ellis, C. Jim Lim. "The Effect of Calcination Extent on Sorbent Utilization in Calcium Looping". 2019 American Institute of Chemical Engineers Annual Meeting, November 10–15, 2019. Orlando, Florida, USA.



John at the American Institute of Chemical Engineers Conference in Orlando



Sudipta Kumar Mitra submitted his PhD thesis "Tensile development during refining of mixtures of NBSK and hardwood pulp" mid February to an internal examination for defence.

His final defence to his external PhD committee is scheduled mid Spring. We wish him the very best.

Personnel News

Barbara Conway, PhD



Research Grants Facilitator

Barb comes to the BioProducts Institute after working closely with researchers and graduate students of the Faculty of Pharmaceutical Sciences for 20 years. She brings with her a wealth of knowledge about the Canadian research funding landscape and UBC's funding structures, policies and procedures, research ethics and reporting. She has worked directly on grant applications with UBC investigators to help them win over \$4 million in funding from NSERC, CIHR, CRC and CFI. In addition, she has worked on graduate admission and curriculum development, promotions and website development, and policy development and writing.

Barb holds a PhD in Microbiology from the University of Alberta where she worked on the mechanism of bacterial binding to lung cells in cystic fibrosis.

In her spare time, Barb is an instructor of Taoist Tai Chi® arts for the Fung Loy Kok Institute of Taoism™. She is also the proud owner of Arya, a German Shepherd. Arya keeps Barb on her toes due to her sincere desire to chase all the rabbits and squirrels she sees on her walks.

Richard joins the UBC BioProduct Institute as the **Director of Partner Innovations**. He is a graduate of Electrical Engineering (Queen's University) and Master of Business Administration (Richard Ivey, University of Western Ontario). Richard's career has focused on developing and commercializing technology with a variety of technology leaders such as Harman Becker, Nortel, MPR, and Ascom as well as several growth companies including 3 start-ups. Richard is both a French and Canadian citizen and has worked in Switzerland, China, United States and Canada.

He joined UBC in 2010 to champion initiatives to increase number of industry–researcher engagements and the quality of applied outcome research collaborations.

Richard Sones



BioAlliance Initiatives



Delegates at the partnering event at DBFZ in Leipzig.

During the first week of March, Emil Gustafsson, Senior Research Project Manager of BPI, and Professor Shahab Sokhansanj, BPI member and Director of the Biomass and Bioenergy Group at UBC, travelled to Germany to participate in the Canada–Germany Bioeconomy Cooperative R&D Partnering Mission and Event. The purpose of this mission, arranged by the Canadian High Commission in Berlin, was to nucleate collaborations between Canadian and German small and medium sized enterprises (SMEs) operating in the bioeconomy area. In addition to the SMEs and our bilateral delegations, representatives from funding agencies, research institutes and universities also attended.

The event's itinerary started with a visit to an impressive scale-up facility for industrial biological processes at Fraunhofer Institute for Chemical Biotechnological Processes in Leuna, west of Leipzig. Then followed a two-day partnering event held at the German Biomass Research Center DBFZ in Leipzig. The program consisted of presentations from both delegations as well as informal partnering events. The last two days of our business visit were spent in Bavaria with the first stop at Technical University Munich (TUM) Straubing campus, a university facility fully dedicated to bioeconomy research.

The next stop was Biocampus Straubing, an incubator for biobased companies, where six local start-up companies delivered presentations to the Canadian delegation. Finally, after a stop at Weihenstephan Bavarian State Brewery, the world's oldest brewery founded in 1040, the trip concluded with a visit to TUM Weihenstephan Life Sciences and Bioeconomy Campus, a research facility with strong focus on food science and, of course, brewing.

The trip was very well organized and we gained several connections that are likely to lead to collaborative projects involving UBC researchers and German partners.

COVID-19: PPE and meeting UBC's Critical Supply Challenges

In March, UBC's Safety and Risk Services and Supply Management issued a call to all departments to provide inventory of critical supplies and contribute to collective efforts. Three directives prompted this call to action.

1. Safety and Risk (SRS) management teams were leading an initiative to track and coordinate an inventory of critical supplies at UBC, in the light of COVID-19.
2. They reached out to units with stores of critical supplies on campus, including personal protective equipment (PPE).
3. SRS's objective was to create a picture of UBC's critical supplies quickly to ensure that the university could meet its needs.

PPC's Response

- Performance BioFilaments, an industry partner in residence, donated 2 face shields and 20 pieces of N95 face masks.
- Energy Reduction in Mechanical Pulping donated 7 boxes of nitrile gloves and 10 pieces of N95 face masks.
- PPC donated 3 pieces of P95 face masks, 3 pairs of long Nitrile-Chem gloves, 11 pairs of safety glasses, 2 full-face respirators, one half-face respirator, 3 pairs of filter cartridges, and 2 pairs of goggles.

Every bit helps in collective action. We're in this together

PPC Laboratory Updates

New research programs from the ERMP Phase 3 group and the BioProducts Institute are bringing many changes to our facilities. In addition to creating brand new laboratory spaces, the incoming research programs have also placed focus upon improvements to existing equipment. Several repairs and upgrades were successfully completed the last few months to accommodate future increases in demand.

ERMP's Dynamic Sheet Former was recently repaired and is now producing large customized multilayered paper sheets. Additionally, the newly improved operator controls that were installed have enhanced our ability to replicate and investigate the industrial practices involved in papermaking. Now fully functionally, this machine is expected to be at the centre of several upcoming research projects.

Mechanical issues in the controlled paper testing room were resolved to moderate and maintain constant temperature and humidity conditions, essential for the accurate analysis of paper materials. Several months back the system governing these properties unexpectedly failed.



The dynamic sheet former is back in action with a few nifty controls added.



George recalibrates a piece of equipment at BCIT.

PPC Laboratory Updates

PPC's technical staff worked continuously to maintain standard conditions through alternative methods while our facilities staff solved the complex problems surrounding the control system. The control room now stands ready to handle future paper testing needs.

Our partner laboratory at the British Columbia Institute of Technology (BCIT) has also been preparing for the influx of new research projects. Several key pieces of pulp testing equipment underwent maintenance checks and repairs, such as their PFI mill and Bauer McNett machinery. Along with these repairs, have been investigations into re-initiating some larger pulp processing machinery. These improvements will help BCIT's paper testing laboratory operate with greater self reliance and enhance research efficiency.

Underway, are plans to integrate PPC's 12" high consistency refiner into the pilot plant. This move will help streamline pulp processing, increase our ability to handle large volume operations and free up space for new equipment. With more changes occurring over the next few months, PPC staff will continue to investigate ways of improving our laboratories to meet the challenges that the new research projects will bring.



Inside the constant temperature and humidity room where PPC pulp is stored in a controlled environment.

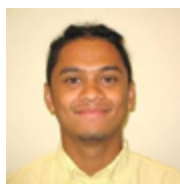
Our Student and Researcher Community

Undergraduates

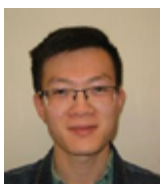
- Christina



- Jordan



- Zezhong



Graduate students

- Arthur



- Omid

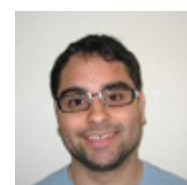


Doctoral students

- Adel Mohammed



- Daniel

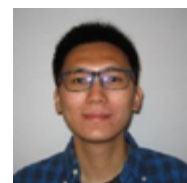


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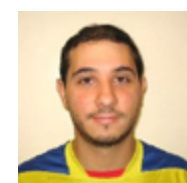
- Hatef



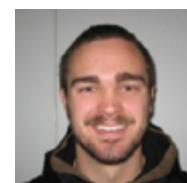
- Long C



- Miguel

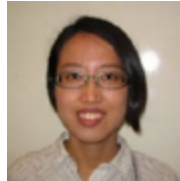


- Nicholas



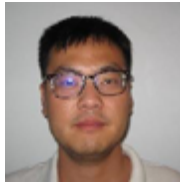
Doctoral students

- Sudipta
- Xiaohe



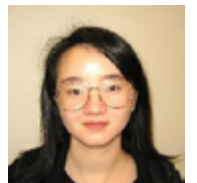
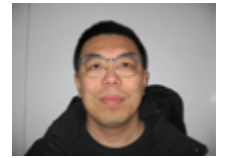
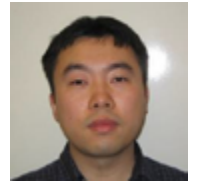
Post-doctoral fellows

- Helei
- Jingqian
- Jordan
- Junnan



Post-doctoral fellows

- Lei
- Long B
- Masoud
- Mohammad
- Siqi
- Ying

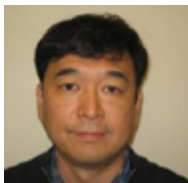


Visiting scholars

- David



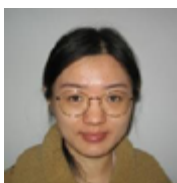
- Jaehyug



- Ryu



- Shasha



- Tianyu



Our
Student and
Researcher
Community

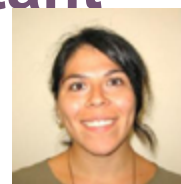
Research associate

- Reza



Research assistant

- Daniela



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Website

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If you would like to be added to our mail list and receive future issues of the *Pulp Digest*, email as directed below.

Contact Chitra Arcot, PPC's Communication Coordinator
Email: Chitra.arcot@ubc.ca

32nd International Mechanical Pulping Conference Vancouver, June 7–10, 2020

Postponed to 2021.



IMPC 2020 heralds our progress towards a low-carbon bioeconomy through courses of action that our forest fibre industries choose to contribute to a resource-efficient world.

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Register early in January 2021.

www.impc2020.org



Pulp and Paper Centre