



THE UNIVERSITY OF BRITISH COLUMBIA  
Materials & Manufacturing Research Institute

# Annual Report 2022-2023

**Collaborative Expertise for  
Innovative Solutions**





# SUMMARY AND HIGHLIGHTS

- **New collaborative research initiatives:** PacifiCan-funded Accelerating Circular Economy (ACE) Platform
- **Continued management and coordination of established research programs:** NSERC CREATE in Immersive Technologies (CITech); Circular Economy Seed Funding; Multidisciplinary Undergraduate Research Projects in Health (MURPH); Biocomposites Research Network; Cluster of Research Excellence in Comfort-Enhancing Technologies; Cluster of Research Excellence in Plastic Recycling; Cluster for Microplastics- Health and the Environment
- **Members success:** Over \$13M research funding; Over 280 articles; Over 180 HQP trainees

Materials and Manufacturing Research Institute (MMRI) is a multidisciplinary, interdepartmental research hub at the University of British Columbia (UBC) fostering collaboration between local, national and international R&D sectors.



### Mission

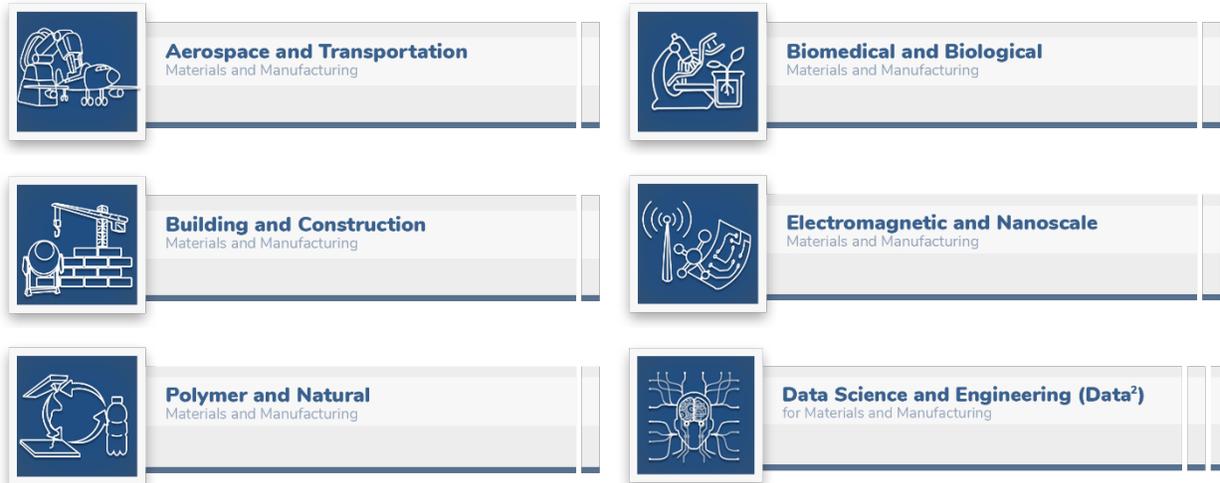
To build on UBC's existing strengths in materials and manufacturing research and create new opportunities for multidisciplinary research in related emerging areas through shared knowledge and network-based funding.

### Vision

MMRI will be a role model linking basic and applied science and contributing to knowledge advancement in multidisciplinary research areas of advanced materials and manufacturing, through close partnership between UBC faculty and other sectors of academia, industry and government organizations; and by world-class training of students and scientists, and dissemination of high-quality research.

# OPERATIONS

**Structure:** MMRI currently has six research pillars that host researchers from a wide range of disciplines across both campuses of UBC and beyond. These pillars include:



**Affiliated Research Clusters and initiatives:** MMRI has supported the establishment of the following research clusters and initiatives at UBC:

- PacifiCan-funded Accelerating Circular Economy (ACE) Platform
- NSERC CREATE in Immersive Technologies (CITech)
- Cluster of Research Excellence in Comfort-Enhancing Technologies
- Circular Economy Seed Funding, funded by NRC-IRAP
- Multidisciplinary Undergraduate Research Projects in Health (MURPH), funded through UBC PURE Program
- Research Cluster in Advancing Multifunctional Dental Biomaterials, funded through UBC GCRC program
- Biocomposites Research Network

**Management team:** Each MMRI research pillar has one dedicated Lead from the Point Grey campus and one Lead from the Okanagan campus who oversee and coordinate the pillar activities. A Chief Development Officer is also leading Cross-Disciplinary Initiative. The MMRI management team is listed below:

- Director: Dr. Abbas Milani (Engineering, UBCO)

- ATMM Leads:
  - Dr. Rajeev Jaiman (Mechanical Engineering, UBCV)
  - Dr. Mohammad Arjmand (Engineering, UBCO)
- BBMM:
  - Dr. David Liu (Biomedical Engineering, UBCV)
  - Dr. Adriana Manso (Dentistry, UBCV)
  - Dr. Sepideh Pakpour (Engineering, UBCO)
- BCMM:
  - Dr. Joe Dahmen (Architecture, UBCV)
  - Dr. Shahria Alam (Engineering, UBCO)
- ENMM:
  - Dr. Frank Ko (Materials Engineering, UBCV)
  - Dr. Jian Liu (Engineering, UBCO)
- PNMM:
  - Dr. Parisa Mehrkhodavandi (Chemistry, UBCV)
  - Dr. Robert Godin (Chemistry, UBCO)
- DSEMM:
  - Dr. Bhushan Gopaluni (Chemical and Biological Engineering, UBCV)
  - Dr. John Braun (Mathematics, UBCO)



**Membership:** MMRI continues to integrate new members from academia and industry into its research structure. The Institute currently boasts 98 academic and 70 industry members.

**Space/facilities:** Since January 2018, the institute has been officially located in EME 2131 on UBC Okanagan campus.

**Staff and administration:** MMRI currently has three full-time as listed below:

- Research Engineer:
  - Mahdi Takaffoli, PhD (full-time)
  - Bryn Crawford, PhD (full-time)
- Administrative Assistant:
  - Jolene Campbell, BBA (full-time)



# ACADEMIC MEASURES

The academic measures reported in this section is based on the information collected from members on their academic records from September 2022 until August 2023. See Appendix I for some academic records demonstrating the excellence of our members in research and training.

**Grants:** MMRI members has received over \$13M research funding from different funding sources.

**Publications:** MMRI members published over 280 articles in peer-reviewed journals.

**Trainee supervision:** MMRI members have been supervising more than 180 graduate students.

## Members Success Stories

- **Dr. Qian Chen.** 'Kit-of-Parts' Platform System (KOPPS) to Provide Affordable, Sustainable and Resilient Housing in Canada was shorlisted with incubation fund from Canadian Housing Mortgage Corporation.
- **Dr. Amir Ardestani-Jaafari.** Received a UBCO 2023 Goden Apple Award for dedication to helping students find value in the learning process.
- **Dr. Babak Tosarkani.** Featured in UBCO news "Preparing for the next wildfire"; Featured in CBC news "As B.C. fires threaten highways, communities fear their access routes will be choked off".
- **Dr. Babak Tosarkani.** Featured in CBC news "As B.C. fires threaten highways, communities fear their access routes will be choked off".
- **Dr. Babak Tosarkani.** Best Paper Award, ASAC 2023 Conference, Toronto, "Sustainable mask distribution planning and recycling under uncertainty: A novel graph theory-based clustering algorithm".
- **Dr. Fatemeh Hendijani Fard.** Keynote speaker at Software Engineering for Machine Learning Applications (SEMLA), Montreal.
- **Dr. Mohamed Shehata.** Winner of the 2022 IEEE Canada Presidents' make-a-difference award, "For significant contributions to IEEE Canada and to advancing the science and engineering profession".

- **Dr. Mohamed Shehata.** 2022/2023 Stanford University World's Top 2% Scientists, version 5, Ranked top 1% in the field of Artificial Intelligence and Image Processing.
- **Dr. Abbas Milani.** "An interactive digital twin of a composite manufacturing process for training operators via immersive technology", won the Silver Medal in Student Design Competition of International Conference on Human-Computer Interaction, 23-28 July, 2023, Copenhagen, Denmark. Student researcher: Iman Jalilvand.
- **Dr. Abbas Milani.** Invited Tutorial (co-taught by MMRI PhD student Milad Ramezankhani and Dr. Milani) by the Society for the Advancement of Material and Process Engineering (SAMPE) Conference, Seattle, WA, USA, April 17th, 2023 (Title: 'When Data-efficient Machine Learning Comes to the Rescue: An AI-based Optimization Framework for Advanced Manufacturing) (over 60 participants from prominent industries).
- **Dr. Hadi Mohammadi.** "Apex bileaflet mechanical valve", US Patent 11,819,402, 2023.
- **Dr. Mohammad Arjmand.** 2023 Journal of Materials Chemistry Emerging Investigator. This distinction showcases the very best work from materials chemists in the early stages of their independent careers in the 2023 Emerging Investigators Themed Collection.
- **Dr. Mohammad Arjmand.** 2023 Killam Faculty Research Prize. UBC Killam Research Prizes are awarded annually to top campus researchers.
- **Dr. Shahria Alam.** Distinguished Visiting Research Fellow, Abu Dhabi University, UAE, March 2023.
- **Dr. Shahria Alam.** Editor's Choice section of the Journal of Structural Engineering - "Zhang, P., & Alam, M. S. (2023). Accuracy of Buckling Strength Curves Using Direct Strength Method in Estimating Axial Strengths of Cold-Formed Steel Members under Compression: Critical Review. Journal of Structural Engineering, 149(3), 04022262.".
- **Dr. Shahria Alam.** 2023 Okanagan Housing Awards of Excellence from the Canadian Home Builders Association of the Central Okanagan for the Wilden Living Lab Project.
- **Dr. Robert Godin.** Featured in UBC Today story on arsenic water remediation "Turning the taps to clean water from Kelowna to Kolkata".
- **Dr. Robert Godin.** Television interview (Radio-Canada, Téléjournal Colombie-Britannique, Épisode du mardi 28 mars 2023).
- **Dr. Jian Liu.** Elected to the Royal Society of Canada (RSC) College of New Scholars, Artists and Scientists.
- **Dr. Jian Liu.** UBC Killam Research Accelerator Fellowship.
- **Dr. Zheng Liu.** Featured in CBC story "A new tool from researchers at UBCO is attempting to predict home values into the future."
- **Dr. Zheng Liu.** Featured in UBCO story "Propelling artificial intelligence to new heights".

# ACTIVITIES AND PROJECTS

## Collaborative research programs

**Accelerating Circular Economy (ACE) Platform:** Launched in November 2022 by The Honourable Harjit S. Sajjan, Minister of International Development, the Accelerating Circular Economy (ACE) platform seeks to facilitate provincial-wide circular economy transformations via the multi-disciplinary and multi-sectorial collaborations between MMRI and the broader community. This program received funding (\$1.04 million) from Pacific Economic Development Canada (PacifiCan). The funding will be primarily used to purchase equipment in support of circular economy and sustainability research. The 17 founding members of ACE are from 5 units at both campuses of UBC: School of Engineering (12), Materials Engineering (2), School Of Architecture and Landscape Architecture (1), Chemistry (1), and Chemical and Biological Engineering (1).

## Government of Canada invests in first-of-its-kind project in B.C. to help businesses create more value and less waste

From: [Pacific Economic Development Canada](#)

### News release

**Funding will enable experts at the University of British Columbia's Okanagan campus to work with local companies to create new bioplastics and save materials from the landfill by using them in new innovations**

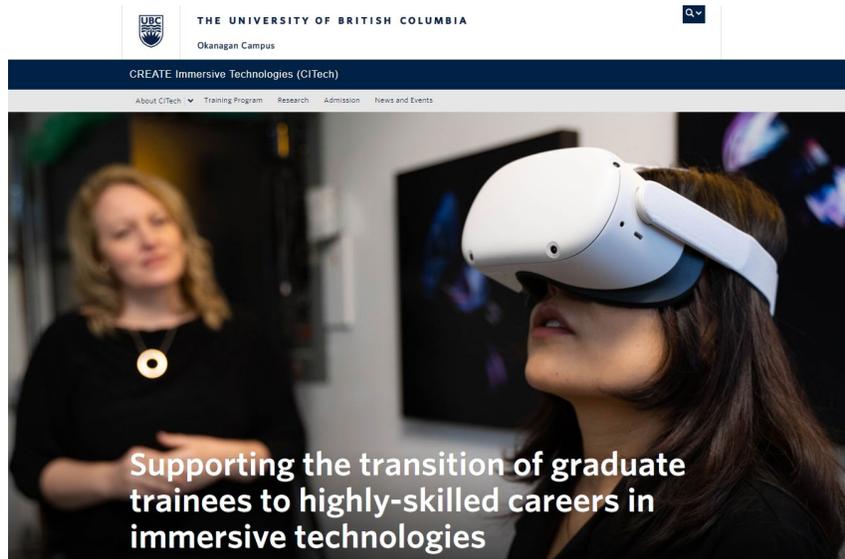
**November 16, 2022** – Kelowna, British Columbia – PacifiCan

The Government of Canada is supporting initiatives that build a clean and prosperous future. That includes helping B.C companies lower their environmental footprint while creating jobs.

Today, the Honourable Harjit S. Sajjan, Minister of International Development and Minister responsible for the Pacific Economic Development Agency of Canada (PacifiCan) announced \$1.04 million in funding to the University of British Columbia's Okanagan campus (UBCO) to help local businesses implement cutting-edge circular economy practices.



**NSERC CREATE in Immersive Technologies (CITech):** In its second year, the program recruited 15 new graduate students from School of Engineering (5), Computer Science (3), UBCV Civil Engineering (4), and Creative and Critical Studies (2). New faculty members joined the program as collaborators, bringing the total number of UBC researchers engaged in the program to 24 from 7 units of UBC: School of Engineering (6), Computer Science (6), Creative and critical Studies (4), Nursing (3), Psychology (1), Occupational Science (3), Civil Engineering (1), and Chemical Engineering (1). A dedicated website for the program was launched in March 2023. Immersive Technologies Seminar Series was also started in January 2023 where 6 talks by national and international professors and artists in topics related to immersive technologies have been held so far.



**A session of Immersive Technologies Seminar Series**



**Multidisciplinary Undergraduate Research Projects in Health (MURPH):** MURPH was run for the fourth time at the Okanagan campus, supporting 9 projects with the involvement of 18 undergraduate students, 16 faculty members, and 3 graduate students (MURPH Graduate Mentors).

**Circular Economy Seed Funding:** 10 university-industry projects relevant to different aspects of circular economy were supported by this funding in 2022-2023. IRAP agreed to extend the program for one more year (until March 2024) and provided additional funding (\$120k).

**Biocomposites Research Network:** An agreement was signed between Elsevier and the lead of the network (Dr. Abbas Milani) based on which the network researchers will prepare a book titled "Biocomposites and the Circular Economy". 8 national and international research groups will contribute to the preparation of the 13 chapters of this book.

**Cluster of Research Excellence in Comfort-Enhancing Technologies:** The cluster team was invited to the full proposal stage of NSERC CREATE. MMRI provided significant support to the development of LOI and full proposal. The cluster is awaiting the final decision regarding their CREATE proposal.



# GOALS FOR NEXT YEAR

- **Lead the development of an NFRF Transformation proposal:** Given that a new round of NFRF Transformation is expected to open in 2023, MMRI plans to take the lead on putting together an LOI. The topic will be decided based on consultation with the members.
- **Continue supporting team-based proposals:** We will remain committed to support planning, team building and writing multidisciplinary proposals for different funding programs, such as CREATE, NSERC Alliance, UBC GCRC and UBCO Eminence.



# CONTACT INFORMATION

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# APPENDIX I: ACADEMIC METRICS

Member Name	Faculty	Number of Publications	\$ Amt Grant Received	Number of Grad Students Supervised/Co-supervised
Apurva Narayan	Western U	12	\$392,000	2
Joseph Dahmen	Applied Science	2	\$91,833	4
Mohamed Shehata	Science	9	\$114,000	11
Abbas Milani	Applied Science	17	\$75,000	16
Xiaoliang Jin	Applied Science	7	-	8
Hadi Mohammadi	Applied Science	5	\$150,000	5
Mohammad Arjmand	Applied Science	34	\$1,200,000	18
Shahria Alam	Applied Science	49	\$2,000,000	19
Sunny Li	Applied Science	6	\$500,000	5
Robert Godin	Science	2	\$1,022,275	4
Hossein Kazemian	UNBC	22	\$1,600,000	11
Rudolf Seethaler	Applied Science	3	\$30,000	5
Jian Liu	Applied Science	18	\$1,750,000	6
Lukas Bichler	Applied Science	6	\$170,000	9
Zheng Liu	Applied Science	32	\$1,200,000	10
Fatemeh Hendijani Fard	Science	7	-	12
Babak Mohamadpour Tosarkani	Applied Science	11	\$155,000	8
Mattia Bacca	Applied Science	1	\$100,000	1
Vicki Komisar	Applied Science	6	-	-



Jongho Lee	Applied Science	4	\$170,000	5
John Braun	Science	2	\$236,500	4
Amir Ardestani-Jaafari	Management	5	-	3
Zhengbo Zou	Applied Science	17	\$1,350,000	8
Parisa Mehrkhodavandi	Science	5	\$575,000	9
Qian Chen	Applied Science	4	\$330,000	2
Total		286	13,211,608	185