



THE UNIVERSITY OF BRITISH COLUMBIA
Materials & Manufacturing Research Institute

Annual Report 2021-2022

**Collaborative Expertise for
Innovative Solutions**





SUMMARY AND HIGHLIGHTS

- **New collaborative research initiatives:** UBC GCRC-funded Research Cluster in Advancing Multifunctional Dental Biomaterials
- **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 \$15M research funding; Over 300 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

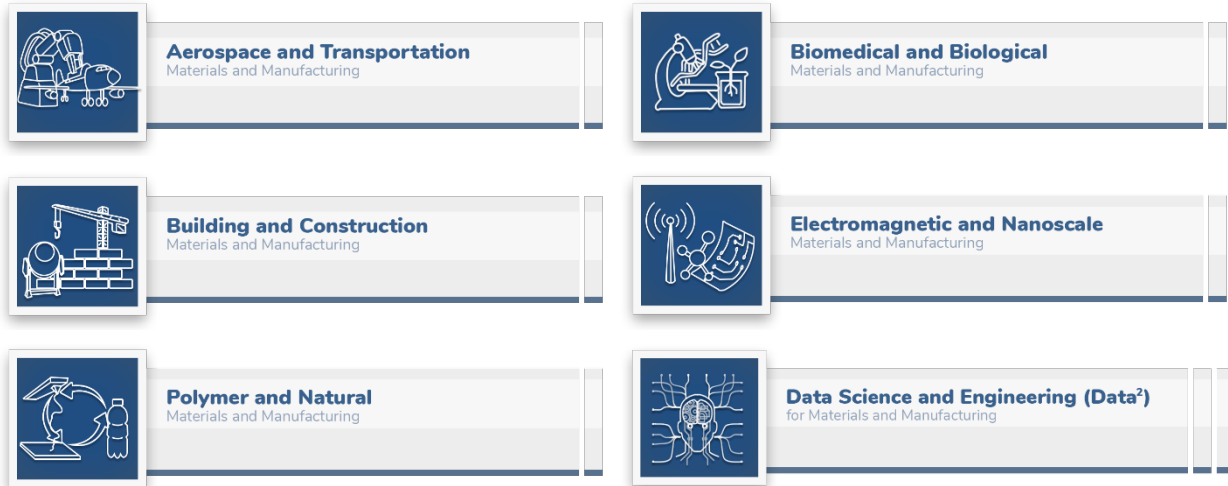
To build on UBC's existing strengths in materials and manufacturing research and create new opportunities for multidisciplinary research in related emerging areas through shared knowledge and network-based funding.

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:

- NSERC CREATE in Immersive Technologies (CITech)
- Cluster of Research Excellence in Comfort-Enhancing Technologies, funded through UBC Eminence Program
- Circular Economy Seed Funding, funded by NRC-IRAP
- Multidisciplinary Undergraduate Research Projects in Health (MURPH)
- Research Cluster for Microplastics, Health and the Environment, 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 93 academic and 65 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 2021 until August 2022. See Appendix I for some academic records demonstrating the excellence of our members in research and training.

Grants: MMRI members has received over \$15M research funding from different funding sources.

Publications: MMRI members published over 300 articles in peer-reviewed journals and conference proceedings.

Trainee supervision: MMRI members have supervised more than 180 graduate students.

Members Success Stories

- **Dr. Parisa Mehrkhodavandi.** Selected as Wall Scholars 2022 by Peter Wall Institute for Advanced Studies.
- **Dr. Jongho Lee.** Featured in UBC Trek Magazine article “Turning skyscrapers into trees”.
- **Dr. Vicki Komisar.** Featured in UBCO news “A rebalancing act”.
- **Dr. Babak Tosarkani.** Featured in Vancouver Island Free Daily news “Diversifying B.C.’s supply chain crucial to combat negative impact of extreme weather”.
- **Dr. Mohammad Arjmand.** 2022 International Association of Advanced Materials (IAAM) Young Scientist Medal. IAAM confers the Young Scientist Medal upon young and upcoming researchers who have conducted quality research in the field of Materials Science, Engineering, and Technology or have demonstrated high merit and potential to do so (International).
- **Dr. Mohammad Arjmand.** 2022 Faculty Emerging Academic Award (2020-2021) in the School of Engineering at the University of British Columbia’s Okanagan Campus (UBCO). This award is given annually to 2 emerging research professors in the School of Engineering at UBCO (Institutional).
- **Dr. Mohammad Arjmand.** 2022 Canadian Society of Chemical Engineering (CSChE) Innovation Award. The CSChE Innovation Award is presented to an individual, who has not



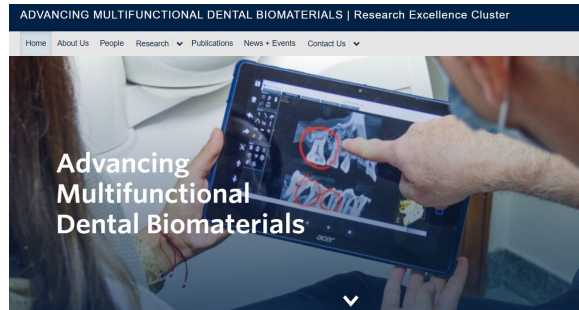
reached the age of 40, for a distinguished contribution to the field of chemical engineering while working in Canada (National).

- **Dr. Mohammad Arjmand.** 2022 Polymeric Materials: Science and Engineering (PMSE) Young Investigator Award. PMSE is a division of the American Chemical Society (ACS). This distinction highlights the accomplishments of early career researchers who are making an impact in the field of Polymer Science and Engineering. There are 21 awardees from across the world in 2022. Dr. Arjmand is the only awardee from Canada (International).
- **Dr. Shahria Alam.** Distinguished invited lecture “Application of Shape Memory Alloys in Earthquake Engineering” by Canadian Association for Earthquake Engineering (CAEE) Dec 7, 2022.
- **Dr. Shahria Alam.** Top Cited Journal Article 2020-2021 (Feb 2023), Earthquake Engineering & Structural Dynamics, Wiley, “Seismic performance assessment of a multispan continuous isolated highway bridge with superelastic shape memory alloy reinforced piers and restraining devices” Among work published in an issue between 1 January 2021 – 15 December 2022.

ACTIVITIES AND PROJECTS

Collaborative research programs

UBC GCRC-funded Research Cluster in Advancing Multifunctional Dental Biomaterials: MMRI played a key role in building the team and facilitating the collaboration between the two campuses for establishing this research cluster through UBC GCRC program. The goal of this cluster is to pursue interdisciplinary research and innovation aimed at the development of dental materials with biocompatible, bioactive, antimicrobial, physical, and chemical properties tailored towards specific oral health needs. This cluster has 11 core faculty members from multiple national and international universities.



Cluster Lead



Dr. Adriana P. Manso
Associate Professor
Faculty of Dentistry

Cluster Research Team



Dr. Mark MacLachlan
Professor
Chemistry, UBC Vancouver



Dr. Emily Cranston
Associate Professor
Chemical and Biological
Engineering, UBC Vancouver



Dr. Mohammad Arjmand
Assistant Professor
Engineering, UBC Okanagan



Dr. Sepideh Pakpour
Assistant Professor
Engineering, UBC Okanagan



Dr. Carmem Pfeifer
Professor
Dentistry, Oregon Health and
Science University



Dr. Abbas Milani
Professor
Engineering, UBC Okanagan



Dr. Luiz Bertassoni
Associate Professor
Dentistry, Oregon Health and
Science University



Dr. Rizhi Wang
Professor
Materials Engineering, UBC
Vancouver



Dr. Ricardo Carvalho
Professor
Dentistry, UBC Vancouver



Dr. Simone Duarte
Assistant Professor
NYU College of Dentistry



NSERC CREATE in Immersive Technologies (CITech): The first cohort of graduate students (total of 11 students) joined the program in September 2021. These students were from the following departments at UBC: School of Engineering (6), Computer Science (2), Creative and Critical Studies (1), and Rehabilitation Sciences, UBC (2). Three new courses, under the code IMTC, were designed and received the approval of the UBCO Senate. In addition, a temporary website was launched for the program.

UBC Okanagan Academic Calendar

[Home](#) / [Course Descriptions](#) / [IMTC](#)

[Copy link](#)

Immersive Technologies, Faculty of Applied Science

IMTC: Immersive Technologies

IMTC 505 (3) Fundamentals of Immersive Technologies

Immersive technology principles; design of AR/MR/VR platforms; immersive interaction techniques; 3D user interfaces; custom XR app design; applications to mobile and wearable devices.

IMTC 506 (3) User-Centered Immersive Design

Immersive design; user-centered and customer-oriented design; project-based learning; project conceptualization; industry- and community-sourced applications of immersive technologies.

IMTC 507 (3) Immersive Technology Design Studio

Application of immersive technologies design skills; interactive immersive technology production; reflection on practice and critical thinking; art in contemporary XR production.

Prerequisite: All of IMTC 505, IMTC 506.

NSERC CREATE in Immersive Technologies (CITech)

A Graduate Specialization Training Program

[About CITech](#)

[Training Modules](#)

[Faculty](#)

[Students](#)

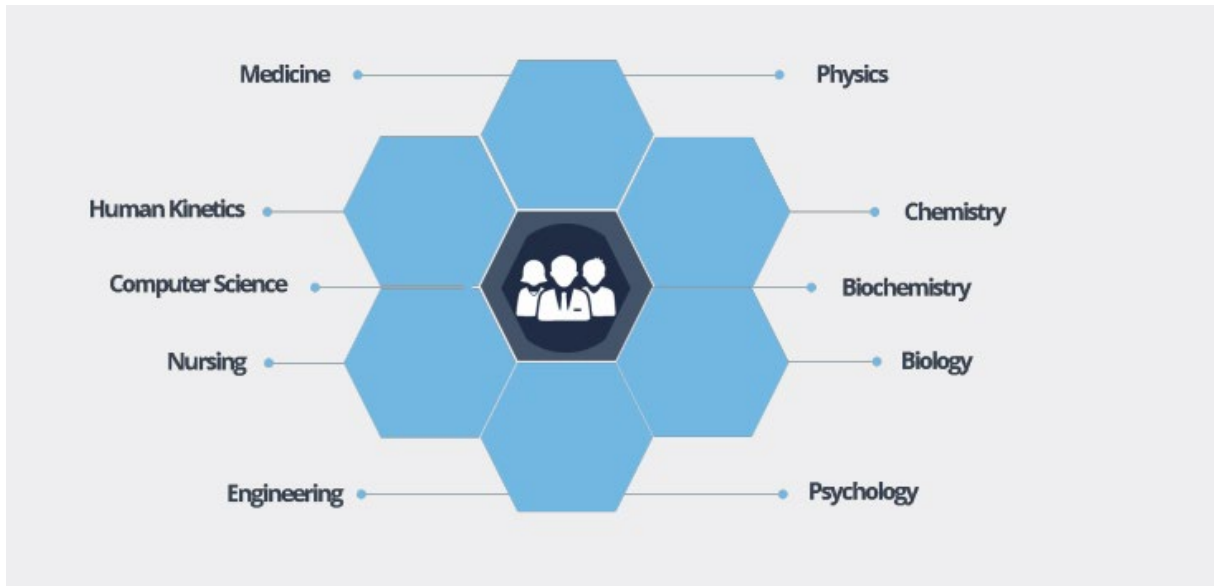
[Admission](#)

[Partners](#)



Multidisciplinary Undergraduate Research Projects in Health (MURPH): MURPH was run for the third time at the Okanagan campus, supporting 10 projects with the involvement of 23 undergraduate students, 19 faculty members, and 2 graduate students (MURPH Graduate Mentors).

Diversity of MURPH Scholars



Recognitions

- MURPH funding was awarded by the Office of the Vice-President, Research and Innovation.
- MURPH inspired the launch of the Faculty of Medicine Multidisciplinary Research Program in Medicine at UBC Vancouver.
- One of the ten MURPH presentations at the 2022 virtual UBC Okanagan Interdisciplinary Student Health Conference (Kelowna) was awarded the best oral presentation in its respective category.
- One MURPH Scholar (Aidan O'Callahan) was awarded the 2021 Lieutenant Governor's medal.



A hybrid MURPH workshop



Research Cluster for Microplastics, Health and the Environment: Since its establishment in March 2021 through UBC GCRC funding program, MMRI took the lead in coordinating the activities of the cluster. These included launching the website, organizing meetings among cluster members, external partnership development, launching the seminar series, etc. These activities helped the cluster to get renewed for another one year in March 2022.

Research Projects



Understanding the seasonal impacts of microplastic inhalation on health

This NFRF-funded project aims to (1) detect and characterize inhalable and respirable microplastics in indoor and outdoor air seasonally, and (2) explore their potential adverse effects on health.

[Learn more >](#)



Sources, sinks and fate of microplastics in the Strait of Georgia and its urbanized watershed: a solution-oriented natural mesocosm study

The goal of this project, funded through NSERC Plastics Science for a Cleaner Future, is to deliver a comprehensive, solution-oriented research package that develops new methods and extends existing ones to study the sources, transport, degradation and fate of microplastics released into coastal waters by a major urbanized watershed.

[Learn more >](#)



Evaluation of the Contributions of the United States to Global Ocean Plastic Waste

The Committee on United States Contributions to Global Ocean Plastic Waste will be evaluating United States contributions to global ocean plastic waste, assessing prevalence of marine debris and mismanaged plastic waste, examining the import and export of plastic waste to and from the United States, and assessing the potential value of a national marine debris monitoring system. In addition, the committee will also develop recommendations on knowledge gaps and recommend potential means to reduce United States contributions to global ocean plastic waste.

[Learn more >](#)



October 22, 2021

UBC Microplastics Seminar Series

Online
Vancouver BC V6T 1Z4
Canada

Microplastics in Urban Stormwater | Dr. Karin Björklund

[Learn more >](#)



October 15, 2021

UBC Microplastics Seminar Series

Online
Vancouver BC V6T 1Z4
Canada

The Multi-Dimensionality of Microplastics – and How That Influences Their Fate and Effects in Aquatic Ecosystems | Dr. Chelsea M. Rochman

[Learn more >](#)



October 1, 2021

UBC Microplastics Seminar Series

Online
Vancouver BC V6T 1Z4
Canada

Fate of Floating Plastic Debris in the Ocean Dr. Matthias Egger Lead Ocean Field Scientist The Ocean Cleanup <https://theoceancleanup.com/> Friday, October 1, 2021 12-1 pm PST

[Learn more >](#)



Circular Economy Seed Funding: MMRI continued to coordinate this program with the financial support from NRC-IRAP. In 2021-2022 round of the funding, 19 short-term projects with BC SMEs and UBC faculty members were supported. In July 2022, NRC-IRAP agreed to a new round of funding where both SMEs and academic leads can be from across the country.

Materials and Manufacturing Research Institute

Home About MMRI Research News Management Team Contact us

 Engage with MMRI

- Research Pillars >
- Members >
- Funding >
- Events >
- Facilities >

Circular Economy Seed Funding-National



UBC, under the coordination of the Materials and Manufacturing Research Institute (MMRI) and with support from the National Research Council of Canada- Industrial Research Assistance Program (NRC-IRAP), is excited to announce a new round of its Circular Economy Seed Funding program. The program aims to provide financial support to academic labs to assist small and



Events organization

MMR Café Series

- Started in February 2022 to facilitate knowledge exchange among members of MMRI.
- 5 events with 10 speakers.
- Recordings are shared on MMRI YouTube channel.



UBC Materials and Manufacturing Research Institute

@ubcmaterialsandmanufacturi5597
11 subscribers

Customize channel

Manage videos

HOME

VIDEOS

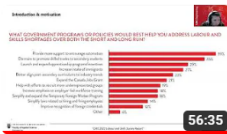
PLAYLISTS

CHANNELS

ABOUT



Videos ▶ Play all



MMRI Café Series Aug - Dr. Dean Richert (UBC...



MMRI Café Series Aug - Dr. van Heusden (UBC...



MMRI Café Series Aug - Dr. Babak Tosarkani (UBC...



MMRI Café Series July - Dr. Richard Aleong (UBC...



MMRI Café Series July - Dr. Irani Pourang (UBC...





GOALS FOR NEXT YEAR

- **Continue supporting team-based proposals:** We will remain committed to support planning, team building and writing multidisciplinary proposals for different funding programs, such as NFRF, CREATE, NSERC Alliance, UBC GCRC and UBCO Eminence.
- **Focus on building capacity for research and industry support toward circular economy:** We aim to explore other fundings to initiate new support programs for circular economy related projects. In this regard, we have started discussion with Western Economic Diversification Canada (WD) staff.



CONTACT INFORMATION

Materials and Manufacturing Research Institute

The University of British Columbia
EME 2131, 1137 Alumni Avenue
Kelowna, BC, Canada V1V 1V7
info.mmri@ubc.ca



Abbas Milani, Director
Professor
School of Engineering
Okanagan Campus
(250) 807-9652
abbas.milani@ubc.ca

Mahdi Takaffoli, Research Engineer
(250) 807-9108
mahdi.takaffoli@ubc.ca



APPENDIX I: ACADEMIC METRICS

Member Name	Faculty	Number of Publications	\$ Amt Grant Received	Number of Grad Students Supervised/Co-supervised
Apurva Narayan	Western U	9	\$270,000	3
Joseph Dahmen	Applied Science	-	\$82,880	4
Mohamed Shehata	Science	6	\$823,000	11
Abbas Milani	Applied Science	18	\$3,262,786	12
Xiaoliang Jin	Applied Science	12	-	8
Hadi Mohammadi	Applied Science	10	\$150,000	6
Mohammad Arjmand	Applied Science	57	\$1,200,000	20
Shahria Alam	Applied Science	44	\$2,100,000	21
Sunny Li	Applied Science	10	\$400,000	8
Robert Godin	Science	4	\$194,000	4
Hossein Kazemian	UNBC	12	\$1,500,000	10
Rudolf Seethaler	Applied Science	3	30,000	6
Jian Liu	Applied Science	19	\$1,650,000	10
Lukas Bichler	Applied Science	4	\$1,032,000	7
Zheng Liu	Applied Science	41	\$744,000	16
Fatemeh Hendijani Fard	Science	7	-	10
Babak Mohamadpour Tosarkani	Applied Science	6	\$60,000	6
Mattia Bacca	Applied Science	1	\$100,000	1
Vicki Komisar	Applied Science	8	460,000	2



Jongho Lee	Applied Science	5	\$80,000	5
John Braun	Science	3	\$80,000	5
Amir Ardestani-Jaafari	Management	2	-	2
Zhengbo Zou	Applied Science	9	\$1,150,000	6
Parisa Mehrkhodavandi	Science	5	\$225,000	6
Qian Chen	Applied Science	15	-	-
Total		310	\$15,593,666	189