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## **May 22-25**

## **University of Alberta**

## **Edmonton, Alberta, Canada**

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Note: This schedule is a draft and may change later.

## **Sponsors**

Thank you to our CMSC 2024 sponsors for their support!



## **Workshop Agenda**

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| May 22, 2024 |
| AM | **Workshop I:** Computer Vision-Guided Deep Learning for Materials Science and Engineering**Length/Agenda:**Morning 3 hours (9am-12pm) total with coffee/tea breaks.**Speakers and their Affiliations**: Dr. Kasra Rezasefat (University of Alberta), Dr. Milad Nazarahari (Assistant Prof. University of Alberta), and Dr. James Hogan (Associate Prof. University of Alberta)**Location:** ECERF-W2-050 | **Workshop III:** Solidification for Welding, Joining and Additive Manufacturing**Length/Agenda:**Morning 3 hours (9am-12pm) total with coffee/tea breaks.**Speakers and their Affiliations**: Dr. Leijun Li (Prof. University of Alberta) and Dr. Olanrewaju Ojo (Prof. University of Manitoba)**Location:** ECERF-W2-010 | **Workshop V:** Advanced Material Characterization: 2D, 3D, and In-situ Microscopy and Spectroscopy (XRD, FIB/SEM and XRM)**Length/Agenda:**1. 9:15am-12:00pm: presentations (3 talks)
2. 12:00pm-1:30pm: Lunch (provided by nanoFAB and sponsors to registered attendees)
3. 1:30pm-4:00pm: Hands-on demonstrations (nanoFAB facility at CME labs). Three demos are running in parallel. Attendees are required to select one. Space of each demo is limited.

**Workshop Coordinators**: Peng Li (Peng.Li@ualberta.ca), Nas Yousefi (nastara1@ualberta.ca), and Griselda Sukmoro (sukmoro@ualberta.ca)**Location:** ECERF W2-090 |
| PM | **Workshop II:** Preparing for Academic Job Applications for New Graduates**Length/Agenda:**Afternoon 2.5 hours (1:30pm-4pm) total with coffee/tea breaks.**Speakers and their Affiliations:**Dr. James Hogan (Associate Prof. University of Alberta)**Location:** ECERF-W2-050 | **Workshop IV:** TeXSupport: LaTeX for the Beginner**Length/Agenda:**Afternoon 3 hours (1:30pm-4:30pm) total with coffee/tea breaks.**Speakers and their Affiliations**: Dr. Beth Sterling Lee (Lab instructor University of Alberta)**Location:** ECERF-W2-010 |
| More Details: <https://cmscconf.org/2024-workshops/>  |

## The ten symposia of CMSC 2024

Room 1: E6-060

Room 2: ETLC E2-E100 East

Room 3: E6-068/064

Room 4: ECERF W2-010

Room 5: ECERF W2-050

Room 6: ECERF W2-090/110

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| --- | --- |
| **AFTP** | Advanced Functional Textiles and Polymers |
| **AMSE** | Advanced Materials for Sustainable Energy and Carbon Management |
| **ARMB** | Advances in Rechargeable Metal Batteries |
| **CPCE** | Critical Minerals: Powering Clean Energy Transitions |
| **MCMS** | Materials and Corrosion Management for a Sustainable Future |
| **MACC** | Metallic and Ceramic Coatings |
| **MAMP** | Metal-Additive-Manufacturing: Processing, Structure, and Properties |
| **CSAE** | Challenges in the Shift to Alternative Energy Futures |
| **NAHE** | Nanomaterials Advancing the Hydrogen Economy |
| **OMCC** | Operando Materials Characterization for Clean Energy |

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| --- | --- | --- |
| **Session ID** | **Time** | **May 23, 2024 (Thursday)** |
|  | 08:30am - 09:30am | **Registrations and Breakfast** |
| **S1** | 09:00am - 09:10am | **Conference Welcome****(By CMSC chair, ETLC E2-E100)** |
| 09:10am - 10:10am | **Plenary Lecture****Ke Lu, Chinese Academy of Sciences****D.K.C. MacDonald Memorial Lecture****(ETLC E2-E100, introduced by CMSC chair)** |
|  |
| **AM** | Room 1 | Room 2 | Room 3 | Room 4 | Room 5 | Room 6 |
| AFTP | AMSE | MCMS | OMCC | CPCE | CSAE |
| A1 | 10:20am - 10:40am | Talk 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| A2 | 10:40am - 11:00am | Talk 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| A3 | 11:00am - 11:20am | Talk 3 | 3 | 3 | 3 | 3 | 3 | 3 |
|  | 11:20am - 11:40am | ***Coffee Break*** |
| A4 | 11:40am - 12:00pm | Talk 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| A5 | 12:00pm - 12:20pm | Talk 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| A6 | 12:20pm - 12:40pm | Talk 6 | 6 | 6 | 6 | 6 | 6 | 6 |
|  | 12:40pm - 01:40pm | ***Lunch*** |
|  |
| **S2** | 01:45pm - 02:30pm | **Keynote Lecture****Dongyang Li, University of Alberta****CMSC Metal Physics Award Lecture****(ETLC E2-E100, introduced by CMSC chair)** |
|  |
| **PM** | Room 1 | Room 2 | Room 3 | Room 4 | Room 5 | Room 6 |
| AFTP | AMSE | MCMS | OMCC | CPCE | CSAE |
| P1 | 02:40pm - 03:00pm | Talk 1 | 7 | 7 | 7 | 7 | 7 | 7 |
| P2 | 03:00pm - 03:20pm | Talk 2 | 8 | 8 | 8 | 8 | 8 | 8 |
| P3 | 03:20pm - 03:40pm | Talk 3 | 9 | 9 | 9 | 9 | 9 | 9 |
|  | 03:40pm - 04:00pm | ***Coffee Break*** |
| P4 | 04:00pm - 04:20pm | Talk 4 | 10 | 10 | 10 | 10 | 10 | 10 |
| P5 | 04:20pm - 04:40pm | Talk 5 | 11 | 11 | 11 | 11 | 11 | 11 |
| P6 | 04:40pm - 05:00pm | Talk 6 | 12 | 12 | 12 | 12 | 12 | 12 |
| P7 | 05:00pm - 05:20pm | Talk 7 | 13 | 13 | 13 | 13 | 13 | 13 |
|  |
| **O1** | 06:00pm - 08:30pm | ***Banquet Dinner (University Club)*** |

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| --- | --- | --- |
| **Session ID** | **Time** | **May 24, 2024 (Friday)** |
|  | 08:30am - 09:30am | **Registrations and Breakfast** |
| **S3** | 09:00am - 09:45am | **Keynote Lecture****Edouard Asselin, The University of British Columbia****CMSC Metal Chemistry Award Lecture****(ETLC E2-E100, introduced by CMSC chair)** |
|  |
| **AM** | Room 1 | Room 2 | Room 3 | Room 4 | Room 5 | Room 6 |
| AFTP | AMSE | MCMS | MACC | MAMP | ARMB |
| A1 | 10:00am - 10:20am | Talk 1 | 14 | 14 | 14 | 1 | 1 | 1 |
| A2 | 10:20am - 10:40am | Talk 2 | 15 | 15 | 15 | 2 | 2 | 2 |
| A3 | 10:40am - 11:00am | Talk 3 | 16 | 16 | 16 | 3 | 3 | 3 |
|  | 11:00am - 11:20am | ***Coffee Break*** |
| A4 | 11:20am - 11:40am | Talk 4 | 17 | 17 | 17 | 4 | 4 | 4 |
| A5 | 11:40am - 12:00pm | Talk 5 | 18 | 18 | 18 | 5 | 5 | 5 |
| A6 | 12:00pm - 12:20pm | Talk 6 | 19 | 19 | 19 | 6 | 6 | 6 |
|  | 12:30pm - 01:30pm | ***Lunch*** |
|  |
| **PM** | Room 1 | Room 2 | Room 3 | Room 4 | Room 5 | Room 6 |
| AFTP | AMSE | NAHE | MACC | MAMP | ARMB |
| P1 | 01:40pm - 02:00pm | Talk 1 | 20 | 20 | 1 | 7 | 7 | 7 |
| P2 | 02:00pm - 02:20pm | Talk 2 | 21 | 21 | 2 | 8 | 8 | 8 |
| P3 | 02:20pm - 02:40pm | Talk 3 | 22 | 22 | 3 | 9 | 9 | 9 |
| P4 | 02:40pm - 03:00pm | Talk 4 | 23 | 23 | 4 | 10 | 10 | 10 |
|  | 03:00pm - 03:20pm | ***Coffee Break*** |
| P5 | 03:20pm - 03:40pm | Talk 5 | 24 | 24 | 5 | 11 | 11 | 11 |
| P6 | 03:40pm - 04:00pm | Talk 6 | 25 | 25 | 6 | 12 | 12 | 12 |
| P7 | 04:00pm - 04:20pm | Talk 7 | 26 | 26 | 7 | 13 | 13 | 13 |
| P8 | 04:20pm - 04:40pm | Talk 8 | 27 | 27 | 8 | 14 | 14 | 14 |
| P9 | 04:40pm - 05:00pm | Talk 9 | 28 | 28 | 9 | 15 | 15 | 15 |
|  |
| **O2** | 05:00pm - 06:00pm | ***Poster Session (ETLC E2-E100 West)*** |

Symposium:

**Advanced Functional Textiles and Polymers (AFTP)**

Thursday-Friday, May 23-24, 2024

Room: E6-060, ETLC

Chairs: Patricia Dolez, Dan Sameoto

*10:20am - 10:40am, May 23*

AFTP1: **(Invited)** Regulating Pulsatile Flows in Mock Ex-Vivo Heart Perfusion Device by Jacketed Elastomeric Tubes

*Hyun-Joong Chung, University of Alberta*

*10:40am - 11:00am, May 23*

AFTP2: Integrating Porous Materials with Phase-Change Materials for Sustainable Energy Storage and Remediation of Heavy Oil Spills

*Yihao Guan, University of Alberta*

*11:00am - 11:20am, May 23*

AFTP3: Highly Stretchable Transparent Anti-icing Self-Cleaning Shield

*Jueun Lee, University of Alberta*

*11:40am - 12:00pm, May 23*

AFTP 4: Fitting female firefighters: How alterations can enhance the safety and comfort of protective clothing

*Jemma Forgie, University of Alberta*

*12:00pm - 12:20pm, May 23*

AFTP 5: Effects of Compression and Moisture on the Thermal Insulation of Sleeping Bags

*Parian Mohamadi, University of Montreal*

*12:20pm - 12:40pm, May 23*

AFTP 6: Hydrothermal aging of PBO fabric – Effect of liquid/vapor water phase and temperature

*Rajitha Botheju, University of Alberta*

*02:40pm - 03:00pm, May 23*

AFTP 7: Additively Manufactured Colorimetric pH Sensor Based on Polyacrylamide/Alginate Double Network Hydrogels

*Rayan Basodan, University of Alberta*

*02:40pm - 03:00pm, May 23*

AFTP 7: Additively Manufactured Colorimetric pH Sensor Based on Polyacrylamide/Alginate Double Network Hydrogels

*Rayan Basodan, University of Alberta*

*03:00pm - 03:20pm, May 23*

AFTP 8: Ushering the potential of commercial conductive textiles to be used in wearable devices to monitor health

*Moshfiq-Us-Saleheen Chowdhury, University of Alberta*

*03:20pm - 03:40pm, May 23*

AFTP 9: Fabrication of Visible Light Sensitive Electrospun TiO2 Nanofibers Using Squaric Acid for Photocatalytic Application

*Eba Mala Maldaye, Jimma University*

*04:00pm - 04:20pm, May 23*

AFTP 10: Macro-texturing fabric to modify rain droplet contact time

*Nicole Furtak, University of Toronto*

*04:20pm - 04:40pm, May 23*

AFTP 11: Development and Testing of a Clear Stretchable Film for Anti-icing Applications

*David Liu, University of Alberta*

*04:40pm - 05:00pm, May 23*

AFTP12: Metamaterial Structures to Control Infrared Radiation on Polymeric Surfaces: Innovations in Radiative Thermal Management

*Shima Jalali, University of Alberta*

*05:00pm - 05:20pm, May 23*

AFTP13: Laser-assisted reduction of graphene oxide coated on melamine sponge for advanced application in electromagnetic interference shielding

*Henok Atinkut Baye, Myongji University*

*10:00am - 10:20am, May 24*

AFTP14: Development of Methods to Evaluate In-Use Firefighters’ Protective Clothing and Predict Its Remaining Service Life

*David Torvi, University of Saskatchewan*

*10:20am - 10:40am, May 24*

AFTP15: A Tiered Approach Towards Optimization of Lyocell Prototype Development

*Lelia Lawson, University of Alberta*

*10:40am - 11:00am, May 24*

AFTP16: Effect of Microclimate Thickness and Orientation, and Airflow Direction and Velocity on the Dry Thermal Resistance of Sportswear Fabrics

*Md Rashedul Islam, University of Alberta*

*11:20am - 11:40am, May 24*

AFTP17: Additive manufacturing of polyether ether ketone (PEEK)/ lunar regolith composites through fused filament fabrication

*Mohammad Azami, University of Alberta*

*11:40am - 12:00pm, May 24*

AFTP18: Dynamic behavior of cross-ply fiber reinforced polymer composites under in-plane compression

*Yogesh Kumar, University of Alberta*

*12:00pm - 12:20pm, May 24*

AFTP19: Load bearing capacity and operational effectiveness of Single Shear Joints of CFRP Composite Laminate with Spread Tow Thin Plies

*Tabrej Khan, Prince Sultan University*

*01:40pm - 02:00pm, May 24*

AFTP20: Developing a Platform for the Optimization and Quality Control Management of a Perfusion Cannula Fabrication Process

*Anthony Demong, University of Calgary*

*02:00pm - 02:20pm, May 24*

AFTP21: Fabrication of Durable and Inextensible Silicon Rubber Molds Tailored for high-Pressure Embossing of IR Transparent Materials

*Abolfazl Vaheb, University of Alberta*

*02:20pm - 02:40pm, May 24*

AFTP22: Curvy mechanical metamaterials for fracture resistance, energy absorption, and vibration isolation applications

*Ramin Hamzehei, University of Alberta*

*02:40pm - 03:00pm, May 24*

AFTP23: Organogel Coatings to Shed off Mud/Ice/Slush Contaminants

*Zhitong Lin, University of Alberta*

*03:20pm - 03:40pm, May 24*

AFTP24: An endeavor to develop a novel analysis approach for characterizing the time-dependent behavior of PE pipes

*Furui Shi, University of Alberta*

*03:40pm - 04:00pm, May 24*

AFTP25: Fabrication and Evaluation of a Ternary Composite: Hydroxyapatite, Reduced Graphene oxide, and Carboxymethyl Cellulose for Enhanced Mechanical and Biological Performance

*Bableen Flora Talwar, Lovely Professional University*

*04:00pm - 04:20pm, May 24*

AFTP26: Investigating Thermal and Free Vibrational Properties of Grey Cotton Fabric-Wool Garment Waste Sandwich Composite Materials for Car Hood Application

*Melese Shiferaw, Bahir Dar Institute of Technology - Bahir Dar University*

Symposium:

**Advanced Materials for Sustainable Energy and Carbon Management (AMSE)**

Thursday-Friday, May 23-24, 2024

Room: E2-E100 East, ETLC

Chairs: Shiva Mohajernia, Mohd Adnan Khan

*10:20am - 10:40am, May 23*

AMSE1: **(Invited)** Design of Stable Nanocrystalline Multicomponent Alloys Towards Carbon Emission Reduction

*Ahmed Tiamiyu, University of Calgary*

*10:40am - 11:00am, May 23*

AMSE2: Solid Removal in the Warm Lime Softening Process of SAGD Water Treatment: Effects of Coagulant and Flocculant

*Siyu Li, University of Alberta*

*11:00am - 11:20am, May 23*

AMSE3: Tailoring Cu valence states in co-catalysts on ZnTe/ZnO photocathodes for syngas production

*Yi-Cheng Wang, University of Alberta*

*11:40am - 12:00pm, May 23*

AMSE4: **(Invited)** Challenges and prospects for the application of AI tools for the design and optimization of green energy materials

*Chandra Veer Singh, University of Toronto*

*12:00pm - 12:20pm, May 23*

AMSE5: Mesoporous BiVO4 -based Photoelectrode in Water Splitting Photoreactor

*Ali Tavazohi, University of Alberta*

*12:20pm - 12:40pm, May 23*

AMSE6: Nanoindentation studies of halide perovskites

*Ruitian Chen, University of Toronto*

*2:40pm - 3:00pm, May 23*

AMSE7: **(Invited)** Quantifying opportunities and challenges of disruptive processes for future production of zero-CO2 ferroalloys

*Vincent Jacquier, Eramet Ideas*

*3:00pm - 3:20pm, May 23*

AMSE8: Mechanism on mechanical degradation and microstructure evolution of a Cr-Mo steel over long-term service

*Zhe Lyu, University of Alberta*

*3:20pm - 3:40pm, May 23*

AMSE9: Orientation-dependence of Incipient plasticity in Mg-Gd alloy by nanoindentation

*Moein Imani Fouman, University of Manitoba*

*4:00pm - 4:20pm, May 23*

AMSE10: **(Invited)** Synthesis and Evaluation of Nanostructured High-Entropy Alloy Films as Advanced Catalysts for Water Splitting

*Daniela Arango, Natural Resources Canada*

*4:20pm - 4:40pm, May 23*

AMSE11: Synthesis and Evaluation of Nanostructured High-Entropy Alloy Films as Advanced Catalysts for Water Splitting

*Amir Hossein Taghvaei, Queen’s University*

*4:40pm - 5:00pm, May 23*

AMSE12: Electrochemical CO2 fixation and conversion to green urea

*Sourav Paul, Ramakrishna Mission Vidyamandira*

*5:00pm - 5:20pm, May 23*

AMSE13: Gold nanoparticles decorated on COP and anodic Nickel oxide as a multifunctional catalyst for total water splitting, nitro compound reduction and valorization of biomass

*Niyaz Ahamed Sujakani, University of Alberta*

*10:00am - 10:20am, May 24*

AMSE14: **(Invited)** Structural Design and Electrochemical Potassium Storage Properties of Metal Chalcogenides

*Yuhan Wu, Shengyang University of Technology*

*10:20am - 10:40am, May 24*

AMSE15:Chalcogenide nanoparticle sensitized TiO2 nanotube arrays for photocatalysis and photoelectrochemistry

*Damini Vrushabendral, University of Alberta*

*10:40am - 11:00am, May 24*

AMSE16:Effect of T4 and T6 Heat Treatment on the Microstructure and Conductivity of the Aluminum Alloy A356

*Kyle Lessowayl, The University of British Columbia, Okanagan*

*11:20am - 11:40am, May 24*

AMSE17: **(Invited)** Self-extinguishing solid polymer electrolytes for solid-state lithium metal batteries

*Yuhang Zhang, Shenyang University of Technology*

*11:40am - 12:00am, May 24*

AMSE18:Semi-metallic intrinsically decorated Ti-based oxide electrodes for electrochemical hydrogen generation

*Ula Suliman, University of Alberta*

*12:00pm - 12:20pm, May 24*

AMSE19:Semi-metallic intrinsically decorated Ti-based oxide electrodes for electrochemical hydrogen generation

*Navneet Kumar, University of Alberta*

*1:40pm - 2:00pm, May 24*

AMSE20:Innovative Ni-Fe Whiskers for Highly Efficient Oxygen Evolution in Alkaline Media

*Mohsen Fakourihassar, University of Alberta*

*2:00pm - 2:20pm, May 24*

AMSE21:Nanoengineered Zn-modified Nickel Sulfide (NiS) as a Bifunctional Electrocatalyst for Overall Water Splitting

*Chandra Prakash, University of Alberta*

*2:20pm - 2:40pm, May 24*

AMSE22:Titanate photocatalyst/polyurethane foam composite for facile biohydrogen production via photo fermentation from corn

*Alemu Getu Menegeste, Myongji University*

*2:40pm - 3:00pm, May 24*

AMSE23:Novel Polyether Block Amide Polymers for Membrane-Assisted Decarbonization

*Arash Mollahosseini, Nanotechnology Research Centre, National Research Council Canada*

Symposium:

**Materials and Corrosion Management for a Sustainable Future (MCMS)**

Thursday-Friday, May 23-24, 2024

Room: E6-068/064, ETLC

Chairs: Monica Hernandez, Erick Anaya

*10:20am - 10:40am, May 23*

MCMS1: **(Invited)** Investigating Mechanical Properties of ARMOX 500T in High Strain Rates Using Direct Impact Hopkinson Pressure Bar: A Computational Study

*Boakye-Yiadom Solomon, York University*

*10:40am - 11:00am, May 23*

MCMS2: Influence of Metal-Ion Doping on Calcite Growth

*Yue Li, University of Alberta*

*11:00am - 11:20am, May 23*

MCMS3: Fracture toughness mechanism in girth welded X70 pipeline steel with different Ti/N ratio

*Vanda Milani, University of Alberta*

*11:40am - 12:00pm, May 23*

MCMS4: Effect of Hydrogen Absorption on Microstructural, Mechanical and Corrosion Properties of Aged Legacy Pipelines

*Akhilesh Reddy Chopra, The University of British Columbia*

*12:00pm - 12:20pm, May 23*

MCMS5: Corrosion management of Bunsen reaction for sustainable hydrogen production from H2S splitting cycle and S-I water splitting cycle

*Xiaoling Li, University of Saskatchewan*

*12:20pm - 12:40pm, May 23*

MCMS6: Effect of electrochemical hydrogen-charging conditions on nanomechanical properties of X80 pipeline steel

*Qing Hu, University of Calgary*

*2:40pm - 3:00pm, May 23*

MCMS7: Dissociative adsorption of hydrogen molecules at Al2O3 inclusion in steels and its implication on gaseous hydrogen embrittlement of pipelines

*Yinghao Sun, University of Calgary*

*3:00pm - 3:20pm, May 23*

MCMS8: Hydrogen embrittlement susceptibility assessment of quenched and tempered casing steel

*Xu Zheng, McGill University*

*3:20pm - 3:40pm, May 23*

MCMS9: Development of CoCrNi Medium Entropy Alloy Against Hydrogen Embrittlement

*Hanieh Ahmadi, University of Alberta*

*4:00pm - 4:20pm, May 23*

MCMS10: Pin-on-disc wear behaviours of CoCrNi and FeCoNi medium-entropy alloys up to 1000 °C

*Wandong Wang, University of Toronto*

*4:20pm - 4:40pm, May 23*

MCMS11: Interfacial Segregation and Adhesion Effects in Equiatomic CoCrFeNi High Entropy Alloy

*Dennis Boakye, University of Manitoba*

*4:40pm - 5:00pm, May 23*

MCMS12: A review: corrosion management based on machine learning

*Xin Fan, University of Calgary*

*5:00pm - 5:20pm, May 23*

MCMS13: Machine Learning Applications for Predicting Corrosion in Extreme Environments

*Emily Seto, University of Alberta*

*10:00am - 10:20am, May 24*

MCMS14:Investigating the behaviour of welded joints in a high toughness naval steel under different strain conditions

*Alison Mark, Defence Research and Development Canada*

*10:20am - 10:40am, May 24*

MCMS15:The temperature and hydrogen concentration effect on hydrogen-induced crack

*Xiao Xing, China University of Petroleum*

*10:40am - 11:00am, May 24*

MCMS16: Influence of processing parameters on mechanical properties of layer-cladded Inconel 718

*Junfeng Yuan, China University of Mining and Technology*

Symposium:

**Operando Materials Characterization for Clean Energy (OMCC)**

Thursday, May 23, 2024

Room: W2-010, ECERF

Chair: Zhi Li, Keren Jiang, Jigang Zhou

*10:20am - 10:40am, May 23*

OMCC1: **(Invited)** Microstructure Evolution of Amorphous Titanium Oxide: The Role of Environmental Transmission Electron Microscope

*Jian Chen, National Research Council*

*10:40am - 11:00am, May 23*

OMCC2: Operando microwave characterization of carrier dynamics in photodetectors and photocatalysts

*Navneet Kumar, University of Alberta*

*11:00am - 11:20am, May 23*

OMCC3: Axial O ligand modulated Fe-N4 sites for highly efficient electrocatalytic nitrogen reduction

*Yang Yang, University of Alberta*

*11:40am - 12:00pm, May 23*

OMCC4: **(Invited)** nanoFAB Centre – A central hub of operando materials characterization

*Xuehai Tan, University of Alberta*

*12:00pm - 12:20pm, May 23*

OMCC5: Surface Microlenses for Enhanced Photodegradation of Organic Contaminants in Water

*Qinyun Lu, University of Alberta*

*12:20pm - 12:40pm, May 23*

OMCC6: Rare earth Ce-modified V2O5 materials as the cathode for zinc-ion batteries

*Xuesong Xie, University of Alberta*

*2:40pm - 3:00pm, May 23*

OMCC7: **(Invited)** In Situ/Operando Studies of Cu Catalysts for Electrochemical CO2 Reduction by Soft X-ray Spectro-microscopic Characterization

*Chunyang Zhang, McMaster University*

*3:00pm - 3:20pm, May 23*

OMCC8: **(Invited)** Advanced Characterization of Nanostructured Energy Materials

*Shalchi Babak, Natural Resources Canada*

*3:20pm - 3:40pm, May 23*

OMCC9: N/A

*Hanieh Ahmadi, University of Alberta*

*4:00pm - 4:20pm, May 23*

OMCC10: **(Invited)** Synchrotron Applications for Clean Energy

*Feizhou He, Canadian Light Sources*

*4:20pm - 4:40pm, May 23*

OMCC11: Constructing highly dispersed nickel atoms in bamboo liked-carbon nanotubes for efficient oxygen reduction

*Yifan Li, University of Alberta*

*4:40pm - 5:00pm, May 23*

OMCC12: The Nanoindentation Response of Single Crystal Magnesium Using a Finite Element Model That Incorporates the Slip Systems

*Syed Taha Khursheed, University of Manitoba*

Symposium:

**Critical Minerals: Powering Clean Energy Transitions (CPCE)**

Thursday, May 23, 2024

Room: W2-050, ECERF

Chairs: Lucy Liuyin Xia, Daniel Alessi

*10:20am - 11:00am, May 23*

CPCE1: **(Invited)** Case Studies on Reducing CRM Dependency in Canadian Industries

*Patrick Flood, InnoTech Alberta*

*11:00am - 11:20am, May 23*

CPCE2: Wear Characteristics of Al Based Composites Fabricated with Nano Silicon Carbide Particles

*Saeed Daneshmand, Islamic Azad University*

*11:20am - 11:40am, May 23*

CPCE3: Magnesium Doping for Enhanced Stability of Lithium Manganese Oxide Ion-sieves for Lithium Recovery from Flowback and Produced Water

*Fangshuai Wu, University of Alberta*

*11:40am - 12:00pm, May 23*

CPCE4: Evaluating the Mechanical performance of High-Frequency Induction Welded TRIP 690 (AHSS) tubes with Oxide inclusions

*Sydney Okoroafor, University of Waterloo*

*12:00pm - 12:20pm, May 23*

CPCE5: Crashworthiness of critical mineral-based high-entropy alloys designed for structural applications

*Muyideen Adegbite, University of Calgary*

*2:40pm - 3:20pm, May 23*

CPCE7: **(Invited)** Industrial Scale Challenges to the Production of Battery-Grade Graphite to Meet the Exploding Demands of Electric Vehicles

*Kamal Adham, Hatch Associates*

*3:20pm - 3:40pm, May 23*

CPCE8: Industrial Scale Challenges to the Production of Battery-Grade Graphite to Meet the Exploding Demands of Electric Vehicles

*Guijiang Diao, University of Alberta*

*3:40pm - 4:00pm, May 23*

CPCE9: Oxidative Chalcopyrite Leaching under Light Effects

*Binghui Li, The University of British Columbia*

*4:00pm - 4:20pm, May 23*

CPCE10: Improved Direct Lithium Extraction (DLE) Adsorbents for Lithium Extraction from Lithium Bearing Waters (LBWs)

*Karthik* Ramachandran Shivakumar*, University of Alberta*

*4:20pm - 4:40pm, May 23*

CPCE11: A Hybrid Rate Theory Model of Radiation-Induced Growth Including the Formation of Prismatic Vacancy Loops

*Mahdi Mohsini, Queen’s University*

Symposium:

**Challenges in the Shift to Alternative Energy Futures (CSAE)**

Thursday, May 23, 2024

Room: W2-090/110, ECERF

Chairs: Qingyang Liu, Afrooz Barnoush

*10:20am - 10:40am, May 23*

CSAE1: **(Invited)** Suppression of atomic diffusion in Al Mg alloy with schwarz crystal structure (part 1)

*Xiuyan Li, Chinese Academy of Science*

*10:40am - 11:00am, May 23*

CSAE2: **(Invited)** Suppression of atomic diffusion in Al Mg alloy with schwarz crystal structure (part 2)

*Xiuyan Li, Chinese Academy of Science*

*11:00am - 11:20am, May 23*

CSAE3: **(Invited)** The Role of Ce Addition on Strain Localization and the Evolution of Portevin-Le Chatelier (PLC) effect in Direct Chill Cast Al-5wt%Mg Alloy

*Shengze Yin, Queen’s University*

*11:40am - 12:00pm, May 23*

CSAE4: Stable and Efficient Microbubble-Enhanced Cold Plasma Activation for Treatment of Flowing Water

*Ziya Saedi, University of Alberta*

*12:00pm - 12:20pm, May 23*

CSAE5: Microbubble-Enhanced Cold Plasma for Recycling of Wastewater

*Qiuyun Lu, University of Alberta*

*12:20pm - 12:40pm, May 23*

CSAE6: Exploring phase behavior and control of phase stability in fast pyrolysis oil

*Ziting Sun, University of Alberta*

*02:40pm - 03:00pm, May 23*

CSAE7: On the effect of chemical composition on the Liquid Metal embrittlement susceptibility of advanced high strength steels

*Fateme Abdiyan, McMaster University*

*03:00pm - 03:20pm, May 23*

CSAE8: On the Serration Characteristics, Strain Localization Patterns and Crystallographic Texture Development during Tensile Testing of Thermomechanically Processed Thin-Strip Continuous Cast AA5182 Alloy

*Hesam Pouraliakbar, Queen’s University*

*03:20pm - 03:40pm, May 23*

CSAE9: A computationally efficient microstructure evolution model of dynamic recrystallization during hot rolling process

*Shabnam Fadaei Chatroudi, McMaster University*

*04:00pm - 04:20pm, May 23*

CSAE10: Modeling of hydrogen atom distribution at corrosion defect on existing pipelines repurposed for hydrogen transport under pressure fluctuations

*Jin Zhang, University of Calgary*

*04:20pm - 04:40pm, May 23*

CSAE11: Influence of pipeline steel microstructure on hydrogen uptake after gaseous and electrochemical charging

*Tonye Jack, University of Saskatchewan*

*04:40pm - 05:00pm, May 23*

CSAE12: Metamaterial Structures to Control Infrared Radiation on Polymeric Surfaces: Innovations in Radiative Thermal Management

*Qingyang Liu, Hamad Bin Khalifa University*

*05:00pm - 05:20pm, May 23*

CSAE13: Adapting Qatar's LNG Infrastructure for LH2: Feasibility and Challenges

*Sumia Manzoor, Hamad Bin Khalifa University*

Symposium:

**Advances in Rechargeable Metal Batteries (ARMB)**

Friday, May 24, 2024

Room: W2-090/110, ECERF

Chair: Zhixiao Xu

*10:00am - 10:20am, May 24*

ARMB1: **(Invited)** Impact of Pressure Distribution and Magnitude on the Performance of Lithium Metal Anodes

*Matthew Li, Argonne National Laboratory*

*10:20am - 10:40am, May 24*

ARMB2: Viscoplasticity-Driven Suppression of Lithium Dendrite Penetration in Sulfide Electrolytes

*Changmin Shi, Brown University*

*10:40am - 11:00am, May 24*

ARMB3: 3D X-ray Computed Tomography Study of Si-C Composite Anodes in Li-Ion Batteries

*Moin Abid, McMaster University*

*11:20am - 11:40am, May 24*

ARMB4: **(Invited)** Beyond Lithium: Navigating the Landscape of Sodium-ion Batteries with a Spotlight on Nanode's Breakthroughs

*Jiankuan Li, Nanode Battery Technologies*

*11:40am - 12:00pm, May 24*

ARMB5: Challenges in Zn-Air Battery Cell Design

*Matthew Labbe, University of Alberta*

*12:00pm - 12:20pm, May 24*

ARMB6: Quantum Mechanical Investigation of Polypyrrole-MXene Nanocomposite as an Electrode Material for Magnesium-Ion Batteries

*Anthony Ezika, Tshwane University of Technology*

*01:40pm - 02:00pm, May 24*

ARMB7: **(Invited)** Development of High-Performance Inorganic Solid-State Battery Cathodes

*Sixu Deng, Concordia University*

*02:00pm - 02:20pm, May 24*

ARMB8: Organic-Pigment-Mediated Sulfide Electrolyte Redox for All-Solid-State Lithium–Organic Batteries with High Areal Capacity

*Qihang Yu, Concordia University*

*02:20pm - 02:40pm, May 24*

ARMB9: Self-healing and Polar Synergistic Multi-Functional Coating of Sulfur Cathodes for High-Performance Li-S Batteries

*Zhao Yang, Concordia University*

*02:40pm - 03:00pm, May 24*

ARMB10: Functional Electrolyte Additives for Zinc-Ion Batteries

*Jiayao Cui, University of Alberta*

*03:20pm - 03:40pm, May 24*

ARMB11: High performance CuHCF//Zn battery enabled by inner Helmholtz layer regulating co-solvent strategy

*Ziwei Chai, University of Alberta*

*03:40pm - 04:00pm, May 24*

ARMB12: Novel polymer separator for zinc-ion batteries

*Carolina Rodriguez Baez, University of Alberta*

*04:00pm - 04:20pm, May 24*

ARMB13: Surface Electroactive Sites of Tungstated Zirconia Catalysts for Vanadium Redox Flow Batteries

*Aknachew Mebreku Demeku, National Taiwan University of Science and Technology*

Symposium:

Metal-Additive-Manufacturing: Processing, Structure, and Properties (**MAMP)**

Friday, May 24, 2024

Room: W2-050, ECERF

Chairs: André Phillion, Daan Maijer

*10:00am - 10:20am, May 24*

MAMP1: **(Invited)** Extreme mechanics, materials, and manufacturing across scales

*Yu Zou, University of Toronto*

*10:20am - 10:40am, May 24*

MAMP2: Cellular Automata Modelling of Microstructure Evolution in LPBF: A Simulation Study on the Effects of Laser Rescanning Strategies for Grain Refinement and Texture in Microstructure

*Kai Kang, McMaster University*

*10:40am - 11:00am, May 24*

MAMP3: Incorporating non-linear effects in fast semi-analytical thermal modelling of powder bed fusion

*Shaun Cooke, The University of British Columbia*

*11:20am - 11:40am, May 24*

MAMP4: Printability of a water-atomized low-carbon steel powder by laser powder bed fusion

*Mazyar Ansari, Innotech Alberta*

*11:40am - 12:00pm, May 24*

MAMP5: Micro-Spot Laser Direct Energy Deposition of 18Ni Maraging Steel

*Christopher Paul, The University of British Columbia, Okanagan*

*12:00pm - 12:20pm, May 24*

MAMP6: Investigating the wire deposition of TiC-inoculated AA7075 using L-DED and the influence of post-processing heat treatment.

*Taha Waqar, University of Waterloo*

*01:40pm - 02:00pm, May 24*

MAMP7: **(Invited)** Synchrotron Techniques and Their Applications in Additive Manufacturing

*Feizhou He, Canadian Light Source*

*02:00pm - 02:20pm, May 24*

MAMP8: Effects of Sc Addition on Rapidly Solidified Al-10Si-0.4Sc (wt. %) Alloy

*Akankshya Sahoo, University of Alberta*

*02:20pm - 02:40pm, May 24*

MAMP9: A Closer Examination of the Nature of Atomic Motion in the Interfacial Region of Crystals Upon Approaching Melting

*Jiarui Zhang, University of Alberta*

*02:40pm - 03:00pm, May 24*

MAMP10: Continuous dynamic recrystallization during microindentation

*Mina Dehghan, University of Calgary*

*03:20pm - 03:40pm, May 24*

MAMP11: Uncovering the Mechanism behind Two-Step Infiltration during Layered Wide Gap Brazing of MAR-M247 using B-containing Filler Metals

*Coleton Parks, McMaster University*

*03:40pm - 04:00pm, May 24*

MAMP12: Enhancing Mechanical Properties of Al-Cu-Sc Alloy Lattice Structures Through Heat Treatment in Hybrid Investment Casting

*Yifan Li, University of Alberta*

*04:00pm - 04:20pm, May 24*

MAMP13: Effect of layer orientation on the dynamic mechanical response of additively manufactured 18%Ni-M350 maraging steel-high entropy alloy hybrid armour plate

*Timothy Odiaka, University of Saskatchewan*

*04:20pm - 04:40pm, May 24*

MAMP14: Engineering 3D Nanopatterning via Molecular Beam Holographic Lithography

*Tian Tian, University of Alberta*

*04:40pm - 05:00pm, May 24*

MAMP15: Direct Energy Deposition and Characterization of NiSi12-wt% Alloy Variants on Inconel 625 Substrate

*Mohammad Ibrahim, University of Agder*

Symposium:

**Metallic and Ceramic Coatings: Innovations, Applications, and Performance (MACC)**

Friday, May 24, 2024

Room: W2-010, ECERF

Chairs: Mostafa Yakout, Maria Ophelia Jarligo, Meifeng Li

*10:00am - 10:20am, May 24*

MACC1: **(Invited)** Advancements in environmental barrier coatings for SiCf/SiC composite

*Jingyang Wang, Chinese Academy of Sciences*

*10:20am - 10:40am, May 24*

MACC2: Effect of PH and Stirring Rate on Micro-Indentation Hardness and Microstructure of Ni-SiO2 Nanocomposite Coatings Electrodeposited from Deep Eutectic Solvent

*Mehry Fattah, York University*

*10:40am - 11:00am, May 24*

MACC3: Step load nanoindentation: physical model and comparative study on FCC systems

*Lizhong Lang, University of Toronto*

*11:20am - 11:40am, May 24*

MACC4: Mechanical Behavior of AlCoCrFeMo High-entropy Alloy under Uniaxial Tension using Molecular Dynamics Simulation

*Nashit Jalal, University of Alberta*

*11:40am - 12:00pm, May 24*

MACC5: Hardness of Cold-sprayed Stable Nanocrystalline High-Entropy Alloys Evaluated through Nanoindentation

*Kasimuthumaniyan Subramanian, University of Calgary*

*12:00pm - 12:20pm, May 24*

MACC6: Wafer-scale development, characterization, and high temperature stabilization of epitaxial Cr2O3 films grown on Ru(0001)

*Ahmed Hegazy, University of Central Florida*

*01:40pm - 02:00pm, May 24*

MACC7: **(Invited)** Submerged-Arc Welding Overlay for impact abrasion applications

*Jing Li, Trimay Wear Plate Ltd.*

*02:00pm - 02:20pm, May 24*

MACC8: Effect of Al-Si coating weight on the experimental heat transfer coefficient of 22MnB5 steel during hot stamping

*Ardhendu Bhattacharya, University of Waterloo*

*02:20pm - 02:40pm, May 24*

MACC9: A “gene-like” parameter for material tailoring: Begin with the electron work function for multi-element carbide discovery—A first-principles study

*Dong Zhang, University of Alberta*

*02:40pm - 03:00pm, May 24*

MACC10: Techno-Economic Assessment of Application of Cold Spraying for Fabrication of Resistive Heating Elements for Prevention of Icing in Steel Pipes

*Peter Menghesha, University of Alberta*

*03:20pm - 03:40pm, May 24*

MACC11: Correlations between the radiometric properties of galvanneal coating and its phase composition and surface topology

*Michiyo Kagaya, University of Waterloo*

*03:40pm - 04:00pm, May 24*

MACC12: Cold Sprayed Al-Based High Entropy Alloy Coatings with Zirconium Dispersoids

*Mohammad Aatif Qazi, University of Alberta*

*04:00pm - 04:20pm, May 24*

MACC13: Self-stable Nanocrystalline High-Entropy Alloy for High-performance Metallic Coatings

*Moses Adaan-Nyiak, University of Calgary*

*04:20pm - 04:40pm, May 24*

MACC14: Effects of Chain Configuration and Stoichiometry on the Behavior of Boron Carbide at Elevated Temperature from First Principles Quasi-harmonic Approach

*Sara Sheikhi, University of Alberta*

Symposium:

**Nanomaterials Advancing the Hydrogen Economy (NAHE)**

Friday, May 24, 2024

Room: E6-068/064, ECERF

Chair: Karthik Shankar

*01:40pm - 02:00pm, May 24*

NAHE1: **(Invited)** Role of microstructures in hydrogen diffusion in structural metals

*Jun Song, McGill University*

*02:00pm - 02:20pm, May 24*

NAHE2: High Performance Photoelectrochemical Water-Splitting Using Carbon Nitride Sensitized TiO2 Nanorod Array Photoanodes

*Narendra Chaulagain, University of Alberta*

*02:20pm - 02:40pm, May 24*

NAHE3: Environment-friendly Cu:ZnInSe/ZnSeS core/shell QDs sensitized TiO2 photoanode for efficient photoelectrochemical hydrogen production

*Kokilavani Shanmugasundaram, Institut national de la recherche scientifique*

*02:40pm - 03:00pm, May 24*

NAHE4: Bismuth oxyhalide based photocatalysts for solar driven green H2 fuel production

*Md Masud Rana, University of Alberta*

*03:20pm - 03:40pm, May 24*

NAHE5: Catalytic Water Gasification and Carbon Reforming at ≤300 °C – It’s About Mechanism, not Structure.

*Jeff Stryker, University of Alberta*

*03:40pm - 04:00pm, May 24*

NAHE6: A combination of first-principle and thermodynamics study of hydrogen uptake on steel

*Aliakbar Sheikhzadeh, University of Alberta*

*04:00pm - 04:20pm, May 24*

NAHE7: Porous and non-porous bimetallic alloy nanoparticle photocatalysts

*Harshitha Rajashekhar, University of Alberta*

*04:20pm - 04:40pm, May 24*

NAHE8: p-type carbon nitride for photocatalytic and photoelectrochemical hydrogen generation

*Biya Saji, University of Alberta*

*04:40pm - 05:00pm, May 24*

NAHE9: 1T&2H-MoS2/Ni3S2 Heterojunction Supported by Nickel Foam for overall Water Splitting

*Michael Zeming Li, University of Alberta*

Plenary Lecture: D.K.C. MacDonald Memorial Lecturer

**Introduction to Schwarz crystal -- a novel metastable structure in extremely-fine-grained metals**

Ke Lu

Chinese Academy of Sciences & Liaoning Academy of Materials

**Abstract:**

Most metals exist in form of polycrystalline states consisting of crystalline grains and grain boundaries. Although with some novel properties such as much elevated hardness and strength, polycrystalline metals with nano-sized grains become unstable. Upon heating or straining, nano-sized grains tend to coarsen through grain boundary migration, or transform into metastable glassy phases when the grains are extremely small, eliminating grain boundaries in both processes. Recently, we found a different metastable structure in polycrystalline face-centered-cubic pure metals and alloys as their grains are refined to extremely-fine sizes (a few nanometers), namely ‘‘Schwarz crystal’’ (1,2). In this structure, the grain boundary networks evolved into the 3D periodical minimal surface (TPMS) configuration constrained with high density twin-boundaries. It is thermally so stable that grain coarsening is inhibited at temperatures even up to the melting point, and its strength is close to the theoretical value. Diffusional processes in alloys like precipitation of intermetallic phase, spinodal decomposition, as well as melting are inhibited with the Schwarz crystal structure (3,4). In this presentation, I will introduce the formation process, structure characteristics, and some properties of the Schwarz crystal structures in a number of pure metals and alloys. Perspectives and future studies on the structure will be discussed.

References:

1. X.Y. Li, Z.H. Jin, X. Zhou, K. Lu, *Science*, 370, 831-836 (2020).
2. Z.H. Jin, X.Y. Li, K. Lu, *PRL*, 127, 136101 (2021).
3. W. Xu, B. Zhang, X.Y. Li, K. Lu, *Science*, 373, 683-687 (2021).
4. W. Xu, Y.M. Zhong, X.Y. Li, K. Lu, *Adv. Mater*, 2303650, 1-7 (2023).

Keynote Lecture: CMSC Metal Physics Award Lecturer

**Towards Electronic Metallurgy – An Electron Work Function Based Framework for Material and Surface/Interface Design**

Dongyang Li

University of Alberta

**Abstract:**

With rapid technological advance and increase in industrial demand for high-performance materials, material design and surface/interface control have been required to rely on more fundamental principles. Various surface/interface and bulk properties of materials are largely governed by their electron behavior, which determines the atomic bond strength and system’s stability. Significant effort has long been made to correlate the properties to the electron state based on quantum mechanics. However, quantum theories are complicated and unfeasible for material design, especially for structural materials which consist of various phases and imperfections. It is thus highly wished to have simple but fundamental parameters, which reflect the electron behavior of materials, for material analysis and design. In this talk, electron work function (EWF), which is the minimum energy to move electrons at Fermi level inside a metal to its surface, is demonstrated to be a promising indicator carrying “genetic-like” information for analyzing materials and providing clues for guiding material design and surface/interface modification. Correlations between EWF and properties of materials and surfaces/ interfaces will be analyzed, and the development of an EWF-based material design methodology or framework towards “electronic metallurgy” will be discussed.

Keynote Lecture: CMSC Metal Physics Award Lecturer

**Hydrometallurgy: the future of copper processing?**

Edouard Asselin

The University of British Columbia

**Abstract:**

Chalcopyrite (CuFeS2) is the world's most abundant copper mineral, accounting for at least 60% of global primary copper production. Copper is a necessary metal for the clean energy transition, and it is expected that this transition will require that we make more copper over the next 25 years than has been produced in the last 5,000 years. Mineral concentrates of chalcopyrite are processed almost exclusively by pyrometallurgical smelting and converting methods. However, these methods suffer from several key shortcomings. New methods to extract copper from chalcopyrite have been investigated across the globe for more than 50 years, but past processing breakthroughs have been rare and commercially unsuccessful. Recent scientific insights about the mineral/solution interface have resulted in promising new hydrometallurgical (aqueous chemistry-based) process development. The challenges and opportunities for the hydrometallurgical processing of chalcopyrite concentrates will be discussed in this presentation. An overview of ongoing work at UBC will be presented.