



## Chartered Engineers Pacific (CEP)

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### NOTICE OF TECHNICAL EVENING PRESENTATION Wednesday, May 19<sup>th</sup>, 2021, 7:00 – 9:00 pm PST

Please join the meeting from the link below.

## CEP Webinar via Microsoft Teams

[http://bit.ly/CEP\\_Webinar\\_May](http://bit.ly/CEP_Webinar_May)

# Enhancing the Performance and Longevity of Sustainable Energy Systems by Engineering Interfacial Interactions

Speaker:

**Dr. Sami Khan, Ph.D**

Assistant Professor in School of Sustainable  
Energy Engineering at SFU

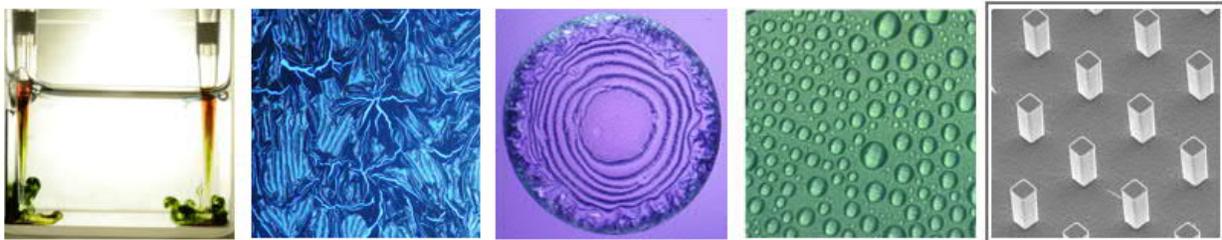
- Finalist, Hydrogen Can Science Slam Competition held at the Berlin Science Week, organized by the National Research Council of Canada along with Natural Resources Canada (2020)
- William Stewart Award for Leadership and Student Service, received from the Chancellor of MIT (2019)
- Marcel Pourbaix Prize (1st place) for Best Poster, Annual NACE Corrosion Conference in Nashville, TN (2019)
- Public Service Fellowship received from the MIT Priscilla King Gray Public Service Center (2017)
- NSERC Canada Postgraduate Scholarship (2016-2019)
- Young Researcher Award received at the World Hydropower Congress in Beijing (2015)
- Hydro Research Foundation Award from the US Department of Energy (2014)
- Ernest Walton medal received from the President of Ireland for undergraduate thesis (2012)
- Gordon Cressy Leadership Award, received from the President of University of Toronto (2012)
- German Academic Exchange (DAAD) Scholarship for summer internship in Munich (2011)
- Accenture Scholarship for academic performance and volunteerism (2011)



## Abstract

The development of alternative clean energy technologies and greener processes to produce chemicals is driven by the growing need to reduce carbon footprint. With any conversion processes, especially those that involve aqueous environments, there exist fundamental challenges such as 1) maximizing activity (rate of generation of products of interest), 2) selectivity to these products, and 3) longevity and reliability towards maintaining continuous, sustained operations. These challenges often arise from interactions at interfaces, including both electrochemical reactions (e.g., evolution of methane and ethanol from a catalyst surface during electroreduction of CO<sub>2</sub>) and physical interactions (e.g., sticking of methane bubbles and ethanol layers to the electrocatalyst), occurring at distinct length-scales and timescales. Deciphering and controlling mechanisms underlying these interactions is critical to designing improved and long-lasting sustainable energy and chemical generation systems.

In this talk, interfacial engineering methods to enhance the rate and conversion of CO<sub>2</sub> capture, and control detrimental processes such as corrosion and hydrogen embrittlement will be introduced. A special class of ceramics comprising the lanthanide series rare-earth oxides (REOs) will be discussed for their potential in enhancing the longevity of sustainable energy systems by repelling water and scale formation. Thin-film coatings of these hydrophobic REOs show sustained dropwise condensation behavior for over 100 hours at accelerated saturated steam conditions without compromising structural integrity or hydrophobicity, and produce a tenfold enhancement in the heat transfer co-efficient ( $103 \pm 5$  kW/m<sup>2</sup>K) compared to conventional filmwise condensation (usually <10 kW/m<sup>2</sup>K). Applications of robust hydrophobic coatings and interfacial engineering techniques in a variety of sustainable energy systems will be discussed.



## Biography

Dr. Sami Khan is an Assistant Professor in the School of Sustainable Energy Engineering at Simon Fraser University. He obtained his Ph.D. in Mechanical Engineering from MIT in 2020. At SFU, Dr. Khan leads the Engineered Interfaces for Sustainable Energy (EISEn) group, which aims to improve the performance and longevity of sustainable energy systems by fundamentally understanding and tuning electro-chemo-physical interactions at interfaces, with a particular focus on enhancing CO<sub>2</sub> capture and conversion processes. Dr. Khan is an expert in coatings that reduce fouling, corrosion and hydrogen ingress especially in harsh environments, with a US patent that was recently granted and licensed. He has previously worked in the rare-earth mining industry in Canada and was a Science and Technology Advisor to the Chief Scientist of Natural Resources Canada recently. He is the recipient of many awards including the Marcel Pourbaix Award for Best Poster in Corrosion Science (received at the NACE international CORROSION conference in 2019), the NSERC PGS-D Scholarship (held 2016-2019), and the International Hydropower Association's Young Researcher of the Year Award (2015).

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### **No Registration is Required:**

This event is provided **free of charge** and welcomes all interested **members and guests**.