



## Ideating at Interfaces

### Assist. Professor Sami Khan, Ph.D.

Assistant Professor

Department of Chemistry & School of Sustainable Energy Engineering, Simon Fraser University, Burnaby, BC V5A 1S6, Canada

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#### Abstract:

Interfaces are defined as boundaries between two or more materials, and these are often decisive control points that limit performance and durability through complex physicochemical interactions. In this talk, I will highlight how interfacial engineering can unlock new capabilities in sustainable energy systems and electrochemical technologies. First, I will discuss strategies for soot removal in biomass combustion, where microtextured surfaces promote self-cleaning and reduce fouling [1]. Second, I will show how bubble-harnessing aerophilic surfaces enhance mass transfer for more efficient carbon capture and conversion [2]. Third, I will describe our efforts to mitigate hydrogen embrittlement in pipeline steels using ultra-thin, self-healing coatings that slow hydrogen ingress and provide superior long-term protection [3]. I will conclude by outlining a broader vision for how interfacial science and interfacial engineering can accelerate the transition to net-zero energy systems and improve the longevity of clean energy technologies in the face of climate change.

#### Speaker's profile

Dr. Sami Khan is an Assistant Professor in the School of Sustainable Energy Engineering at Simon Fraser University. He earned his Ph.D. in Mechanical Engineering from the Massachusetts Institute of Technology in June 2020 and was subsequently recruited directly into his assistant professor role; at the time, he was the youngest ever faculty member hired in his department. His expertise lies at the intersection of interfacial engineering, wettability of surfaces, and electrochemical materials, with applications in sustainable energy and carbon capture systems. He has secured over CAD \$1.17M in research funding, and, has advised 4 PhD students, 7 Master's students, 12 undergraduate students, and 1 postdoctoral associate. He has delivered over 35 invited talks globally, including recent plenary and keynote talks in Brazil and New Zealand. He has published in prestigious journals such as Scientific Reports (Nature Group), Applied Physics Letters and Nature Materials. He is a chemical engineer by training, and has previously served as a Science and Technology Advisor to the Chief Scientist of Canada. For his contributions, he has received the Government of Canada's Action Canada Award (2021) and the Marcel Pourbaix Corrosion Award (2019).



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