Department of
Mechanical Engineering
The University of Hong Kong

Solar fuel processing at elevated temperatures

(onsite and online)

Seminar organized by the Department of Mechanical Engineering

Date: 28 May 2024 (Tuesday)
Time: 11 A.M. (Hong Kong Time)
Venue: Room 7-34, Haking Wong Building
HKU

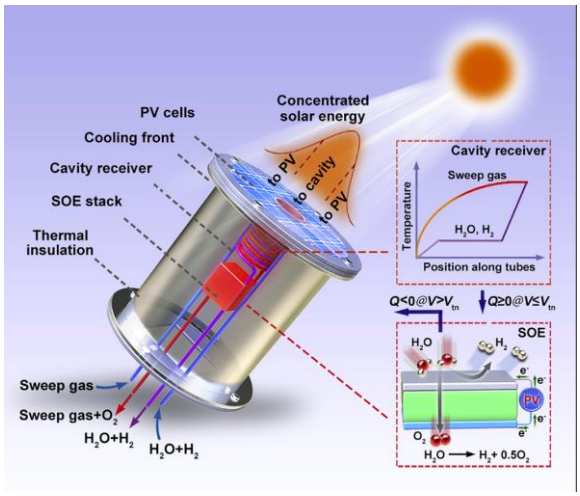
Speaker: Professor Meng Lin
Solar Energy Conversion and Utilization Laboratory
Southern University of Science and Technology

Zoom Online Lecture:
https://shorturl.at/kHKU5

Meeting ID: 942 9779 1444
Password: 834362

Abstract:

Solar energy, with its abundant and renewable characteristics, is considered as an important alternative energy source. However, the dispersed nature (low energy density), intermittency (uneven temporal distribution), and randomness (significant geographical and weather influences) of solar energy resources impose certain limitations to its large-scale practical applications. Therefore, energy storage technologies become particularly important. Converting solar energy into energy-dense forms (such as hydrogen, carbon monoxide, hydrocarbons, etc.) can significantly enhance the stability and economic viability of solar energy utilization. In this talk, I will primarily focus on solar high-temperature fuel processing technologies. By employing multiscale and multiphysical models combined with experimental validation, we aim to understand the coupled energy conversion and transport phenomena in the high-temperature fuel production processes, guiding the engineering of efficient solar fuel devices. Addressing the issue of low efficiency in solar thermochemical hydrogen production, we propose to utilize high-temperature electrochemical oxygen pumps to enhance the oxygen mass transfer of the reduction process, thereby improving fuel production efficiency. Finally, the design and optimization of high-flux solar simulators will be presented for characterizing concentrated solar devices and materials, supporting the research on solar high-temperature fuel production.



References:

[1] Lin, Meng, Clemens Suter, Stefan Diethelm, Jan Van herle, and Sophia Haussener. "Integrated Solar-Driven High-Temperature Electrolysis Operating with Concentrated Irradiation." Joule 4, no. 1 (2022): 1–23.

[2] Bai, Wandong, Haodong Huang, Clemens Suter, Sophia Haussener, and Meng Lin. "Enhanced Solar-to-Fuel Efficiency of Ceria-Based Thermochemical Cycles via Integrated Electrochemical Oxygen Pumping." ACS Energy Letters 7, no. 8 (2022): 2711–16.

[3] Li, Jieyang, Jinpeng Hu, and Meng Lin. "A Flexibly Controllable High-Flux Solar Simulator for Concentrated Solar Energy Research from Extreme Magnitudes to Uniform Distributions." Renewable and Sustainable Energy Reviews 157, no. January (2022): 112084.

Biography:

Meng Lin is an assistant professor heading the Solar Energy Conversion and Utilization Laboratory (SECUL) at the Southern University of Science and Technology (SUSTech), Shenzhen. He received his PhD (2018) in the mechanical engineering from EPFL, Switzerland. Between 2018 and 2019, he was a postdoctoral researcher at the Joint Center of Artificial Photosynthesis (JCAP) and the Chemistry and Chemical Engineering Division of California Institute of Technology (Caltech). In 2019, he joined the department of mechanical and energy engineering at SUSTech with research focus on the engineering of high-performance solar conversion materials, devices, and systems to fulfill industrial-scale needs for electricity, heat, fuels, or a combination thereof. The research of SECUL includes: i) understanding the coupled multiphysics in solar energy conversion devices based on advanced simulation techniques; ii) optimization, design, and control strategies development for solar conversion systems with applications in solar fuel processing, energy storage, and CO_2 capture; iii) advanced characterization equipment innovation allowing for the quantification of components' chemical and transport properties as well as for device and system performance measurement.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. Nicholas Fang at 3917 2639.