

DISTINGUISHED SPEAKER SERIES

Developing Catalysts, Devices, and Processes for Sustainable H₂ Production and CO₂ Conversion

By Prof Thomas F. Jaramillo

Our modern world relies upon chemical transformations that benefit the lives of billions. These transformations are found across many sectors, including transportation, heating and cooling, electricity, food production, and manufacturing. To date, fossil resources have provided the majority of energy demanded by the global economy, and thanks to human ingenuity over decades (and centuries) we have been able to develop large-scale chemical processes that can make use of the fossil resources to provide for many across the globe in a cost-effective manner. However, there are many challenges to the current paradigm, as (1) modern processes are generally not sustainable, and (2) while they provide for billions, there are billions of others who have minimal access to the modern energy system.

This talk describes efforts envisioned for a future paradigm, particularly on the development of new catalysts and new processes that can make use of renewable resources in the production, storage, and utilization of important molecular products. Examples include hydrogen (H₂) production from water and CO₂ conversion to carbon-based fuels and chemicals. A key focus is on the fundamental design and development of catalyst systems that can execute desired chemical transformations with high activity, selectivity, and durability, plus the integration of such catalysts into devices that can achieve high-performance, paving the path ahead for new, sustainable technologies. This talk focuses on two particular technological areas: water and CO₂ electrolysis, which can directly employ renewable electricity for chemical manufacturing, and solar photoelectrochemical (PEC) devices, which can execute desired chemical transformations under direct illumination.



Wednesday, 4 January 2023



10 to 11am



Hybrid Session

In Person:

LT1 -- 5 Engineering Drive 2, Singapore 117579

Via Zoom:

<https://nus-sg.zoom.us/j/89865238260?pwd=ZzhLVlElwRmpqMTZQNFo4OURzUjA2dz09>

Meeting ID: 898 6523 8260

Passcode: 339073



Prof. Jaramillo earned a BS in chemical engineering at Stanford University, his MS and PhD degrees in chemical engineering at the University of California, Santa Barbara. He pursued post-doctoral research as the Hans Christian Ørsted Postdoctoral Fellow at the Technical University of Denmark, Dept of Physics, prior to joining the Stanford faculty. His research efforts are aimed at developing catalyst materials and new processes to improve sustainability in the energy and chemical sectors. A key emphasis is engineering catalyst materials at the nano- and atomic-scale to induce desired properties, and on designing and developing new technologies that employ them. He's authored over 200 publications in the peer-reviewed literature, and earned a number of honors and awards for his efforts. To name a few, honors include the Paul H. Emmett Award in Fundamental Catalysis (2021) from the North American Catalysis Society, the Resonate Award (2014) from the Resnick Institute and the Presidential Early Career Award for Scientists & Engineers (2011). Prof. Jaramillo is on the annual list of Highly Cited Researchers by Clarivate Analytics, ranking in the top 1% by citations (2018-present).