COLLEGE OF ENGINEERING
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Mechanical Engineering Seminar Series

Moving the Needle on Climate Change: New Innovations in High Temperature Systems

Asegun Henry
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Mechanical Engineering
MIT

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4:00 p.m. - **Virtual Only**

ME Seminar Zoom link (QR Code below)

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Abstract

To mitigate climate change, we have to decarbonize the stationary power, transportation, and industrial sectors. One of the most logical approaches to doing so is to decarbonize the grid by developing and deploying low-cost energy storage paired with renewables, electrifying the transportation fleet, and electrifying industry, such that they draw from a clean grid. If full decarbonization is realized these three sectors would comprise more than 60% of CO2 emissions, and would in essence solve the majority of the problem. Since the cost of renewables has dropped dramatically over the last two decades, energy storage is now the key technology to realizing a decarbonized grid. Technologies that are commercially available today are unable to meet the future needs of the grid. However, the Atomistic Simulation & Energy (ASE) group at MIT is developing an extremely low-cost (< $10/kWh) technology that can meet future grid needs, termed thermal batteries. Thermal batteries are grid-scale rechargeable batteries that store electricity as extremely high-temperature heat, instead of electrochemically. In addition, the ASE group is also developing a high-temperature system for hydrogen production based on methane pyrolysis. This talk will review how both technologies work, progress to date, and will highlight the new innovations that enabled it.

Bio

Dr. Asegun Henry started as an Associate Professor in the Department of Mechanical Engineering at MIT in 2018, where he directs the Atomistic Simulation & Energy (ASE) Research Group. Prior to MIT, he was an Assistant professor in the Woodruff School of Mechanical Engineering at Georgia Tech from 2012 to 2018. He holds a B.S. degree in Mechanical Engineering from Florida A & M University as well as a M.S. and Ph.D. in Mechanical Engineering from MIT. Professor Henry's primary research is in heat transfer, with an emphasis on understanding the science of energy transport, storage, and conversion at the atomic level, along with the development of new industrial-scale energy technologies to mitigate climate change. After finishing his Ph.D. he worked as a postdoc in the Materials Theory group at Oak Ridge National Laboratory (ORNL) and then as a postdoc in the Materials Science Department at Northwestern University. After Northwestern, he worked as a fellow in the Advanced Research Projects Agency-Energy (ARPA-E), where he focused on identifying new program areas, such as higher efficiency and lower cost energy capture, conversion, and storage. Professor Henry has made significant advances and contributions to several fields within energy and heat transfer, namely: solar fuels and thermochemistry, phonon transport in disordered materials, phonon transport at interfaces, and he has developed the highest temperature pump on record, which used an all-ceramic mechanical pump to pump liquid metal above 1400°C. This technological breakthrough, which is now in the Guinness Book of World Records, has opened the door for new high-temperature energy systems concepts, such as methane cracking for CO2 free hydrogen production and a new grid-level energy storage approach affectionately known as "Sun in a Box," that is cheaper than pumped hydro. Professor Henry has also been the recipient of a number of awards including the National Science Foundation Career Award, the Lockheed Inspirational Young Faculty Award, the Georgia Power Professor of Excellence Award, the ASME Bergles-Rohsenow Young Investigator Award in Heat Transfer and he was the winner of the 2018 World Technology Award for Energy. He has also been awarded a number of fellowships including an MIT Lemelson Presidential Fellowship, a Department of Energy Computational Science Graduate Fellowship, a UNCF-Merck Postdoctoral Fellowship, and a Ford Foundation Postdoctoral Fellowship.

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