COMBUSTION WEBINAR

High Fidelity Simulations of Hydrogen and Ammonia Turbulent Premixed Flames: Physical Characteristics and Modeling Implications

Speaker: Prof. Hong G. Im, CCRC, KAUST

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Abstract: Hydrogen and ammonia have attracted enormous research interests in recent years due to their relevance to viable e-fuels towards carbon-neutral power and transportation. Despite the simplicity in oxidation pathways, combustion of these fuels involves pronounced effects of fast-diffusing major and intermediate species, leading to interesting flame dynamics in turbulent and high pressure conditions. This presentation will provide an overview of recent studies at KAUST using direct numerical simulations to reveal local structures and statistical characteristics of turbulent premixed flames at a wide range of relevant physical parameters. The use of simulation data to provide insights into turbulent combustion modeling implication will also be presented. Recent developments in accelerated simulations using GPU and machine learning will also be briefly discussed.

Biography: Hong G. Im received his B.S. and M.S. in from Seoul National University, and Ph.D. from Princeton University. After postdoctoral researcher appointments at the Center for Turbulence Research, Stanford University, and at the Combustion Research Facility, Sandia National Laboratories, he held assistant/associate/full professor positions at the University of Michigan. He joined KAUST in 2013 as a Professor of Mechanical Engineering. He is a recipient of the NSF CAREER Award and SAE Ralph R. Teetor Educational Award, and has been inducted as an International Member of the National Academy of Engineering of Korea, a Fellow of the Combustion Institute and American Society of Mechanical Engineers (ASME) and an Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA). He has also served as an Associate Editor for the Proceedings of the Combustion Institute, and currently on the Editorial Board for Energy and AI. Professor Im's research and teaching interests are primarily fundamental and practical aspects of combustion and power generation devices using high-fidelity computational modeling. Current research activities include direct numerical simulation of turbulent combustion at extreme conditions, large eddy simulations of turbulent flames at high pressure, combustion of hydrogen and e-fuels, spray and combustion modeling in advanced internal combustion engines, advanced models for pollutant formation, and plasma-assisted combustion.

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