COMBUSTION FOR CLEAN ENERGY: FROM LOW EMISSIONS TO LOW CO_2

Ahmed F. Ghoniem
Massachusetts Institute of Technology

The World's energy consumption is growing rapidly. Hydrocarbons will remain the major primary energy source for many decades, prompting concerns over CO_2 and its climate impact. Near-term strategies, including higher conversion and utilization efficiency, CO_2 capture and expanding renewables should be pursued vigorously. Combustion research must contribute aggressively towards these goals, including work on gas-phase oxy-combustion, membrane-supported thermochemistry and chemical looping combustion. The latter options reduce the energy penalty in oxygen production, but need special catalytic surfaces, device design and system integration. I will review some of our recent work addressing these challenges. Premixed oxy-fuel combustion offers significant advantages, including retrofit, but experiences similar dynamics and instabilities to air combustion. I will cover our recent experimental and numerical work on the subject, some of the fundamental similarities and difference between the two processes and how progress in turbulent combustion and kinetics will enable better implementation of this promising technology.

BIO:

Ahmed F. Ghoniem is the Ronald C Crane Professor of Mechanical Engineering at MIT, and the director of the Center for Energy and Propulsion Research and the Reacting Gas Dynamics Laboratory. He received his B.Sc. and M.Sc. degrees from Cairo University, and Ph.D. at the University of California, Berkeley. His research interests include computational engineering; combustion and thermochemistry; CO_2 capture and reuse (oxy-combustion, membrane separation and chemical looping) and fuel production from renewable sources. He has supervised more than 100 post-doctors and graduate students; published more than 330 refereed articles in leading journals and international conferences; and lectured extensively around the World. He is Fellow of ASME and associate fellow of AIAA.