

Combustion Fundamentals for Future Hyper Lean Burn Spark Ignition Engine Applications: Effects of fuel properties on lean ignition limits and knock onset

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Abstract

Detonation engines, using continuous spinning or rotating waves, are finding use in a broad spectrum of propulsion applications. While research in this area span more than five decades, details of the complex detonation process have been emerging only in the last couple of decades. Such engines involve the three-dimensional interplay of flow geometry and unsteady fuel/air injection, stratified mixtures, and complex wave dynamics including multiple and even counter-propagating structures. Due to the multiscale nature of these problems, computational modeling using even the most powerful computing systems still remains a challenge. In this talk, progress in the detailed representation of single and two-phase detonation configurations, insights learnt, and key challenges are discussed.

Biography

Kaoru Maruta received his Ph.D. in mechanical engineering from Sophia University in 1993. He is Professor, Director of the Institute of Fluid Science, Tohoku University, Japan. Prof. Maruta's research interests include sustainable fuels, their kinetics and energy conversion in the areas of near limit and micro-scale combustion, microgravity combustion and high exergy efficiency combustion, hyper lean burn SI engine technology and fire safety for battery electrolyte and refrigerants. He has published more than 130 refereed journal articles. He served as a Program Co-Chair of the Thirty Fourth International Symposium on Combustion at Warsaw, Poland (2012) and is a founding fellow of the Combustion Institute. Currently, he serves on the Board of Directors of the Combustion Institute and the Institute for Dynamics of Explosions and Reactive Systems. He is the Chair of the Japanese Section of the Combustion Institute. He serves as an Associate Editor of *Combustion Science and Technology* and one of the Editorial Board members of *Combustion Explosion and Shock Waves*, and *Progress in Energy and Combustion Science*. He has received several awards including Young Investigator Award of the First Asia-Pacific Conference on Combustion (1999), Best Paper Award from the Japanese Section of the Combustion Institute (2011), Ichimura Academic Award (2013) and Prize of the Minister of MEXT, Japan (2015).