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東京大学
THE UNIVERSITY OF TOKYO
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Plasma assisted combustion: Progress, Challenges, and Opportunities

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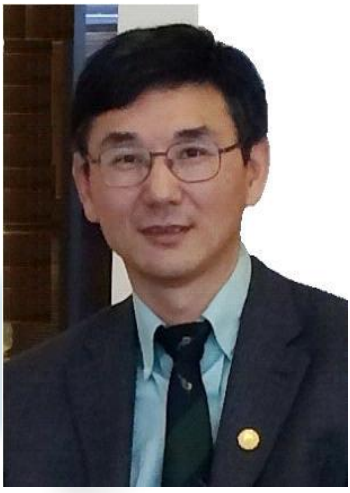

Plasma assisted combustion is a promising technology to improve engine performance, increase lean burn flame stability, reduce emissions, and enhance low temperature fuel oxidation and processing. Over the last decade, significant progresses have been made towards the applications of plasma in engines and the understanding of the fundamental chemistry and dynamic processes in plasma assisted combustion via the synergetic efforts in advanced diagnostics, combustion chemistry, flame theory, and kinetic modeling. New observations of plasma assisted ignition enhancement, ultra-lean combustion, cool flames, flameless combustion, and controllability of plasma discharge have been reported. Advances in understanding of non-thermal and thermal enhancement effects, kinetic pathways of atomic O production, diagnostics of electronically and vibrationally excited species, plasma combustion kinetics of sub-explosion limit ignition, plasma assisted low temperature combustion, flame regime transition of the classical ignition *S*-curve, dynamics of the minimum ignition energy, and the transport effect by non-equilibrium plasma discharge. These findings and advances have provided new opportunities in the development of efficient plasma discharges for practical applications and predictive, validated kinetic models and modeling tools for plasma assisted combustion at low temperature and high pressure conditions.

This article is to provide a comprehensive overview of the progress and the gap of knowledge of plasma assisted combustion in applications, chemistry, ignition and flame dynamics, experimental methods, diagnostics, kinetic modeling, and discharge control.

Professor Yiguang Ju is a Robert Porter Patterson Professor at Princeton University. His bachelor degree in Engineering Thermophyiscs from Tsinghua University in 1986, and his PhD degree in Mechanical and Aerospace Engineering from Tohoku University in 1994. He was appointed as an Assistant and Associate Professor at Tohoku University in 1995 and 1998, and as a Changjiang Professor and the Director of Thermophysics Institute at Tsinghua University in 2000. He joined Princeton University in 2001 and became a full professor in 2011. He received a number of awards including the Distinguished Paper Award from the Thirty-third International Symposium on Combustion (2010), the NASA Director's Certificate of Appreciation award (2011), the Friedrich Wilhelm Bessel Research Award by the Alexander von Humboldt Foundation (2011), and the Robert Porter Patterson Professor of Princeton University (2013).

主催：
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