2011-2012

Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

Dr. Wookyung Kim
United Technologies Research Center

Dr. Wookyung Kim received a B.S. in mechanical engineering from Seoul National University, Seoul, Republic of Korea, in 1999, and an M.S. and Ph.D. in mechanical engineering from Stanford University, Stanford, CA, in 2002 and 2006, respectively. He worked as a post doctoral fellow/research associate at Stanford from 2007 to 2010 and joined United Technologies Research Center as a senior research scientist in 2010. His research interests spans the various aspects of flame and flow stability, which includes plasma assisted flame stabilization, plasma aided flow control, thermo-acoustic phenomena in gas turbine combustors and aero-engine augmentors. He has published more than ten leading author articles in peer reviewed journals in those areas, and has served as a reviewer for various internationally recognized plasma, combustion, and fluid mechanics journals.

Thursday, Oct. 20, 2011 4:00 – 5:00 p.m. Room 112, ME-EM Bldg.

Plasma-Assisted Flame Holding in Subsonic Flows

The implementation of nanosecond pulsed discharge (NPD) to combustion applications is receiving growing attention because of its capability to increase flame stability. In this presentation, our recent studies of three different flame configurations which are assisted by NPD are summarized. The flow configurations are: methane-air jet diffusion flames in coflow and crossflow and methane-air laminar premixed flames. For the methane jet in coflow, it is shown that the flame stability is improved by ten-fold (in terms of coflow speed) with the aid of the NPD. For the methane jet in cross flow, it is found that there exists a significant distance through which radicals formed by the NPD cannot survive between the NPD and flamebase. Based on the observation of jet in cross flow experiments, a simple model (preflame model) of a plasma-assisted methane flame is proposed, which suggests that the central role of the plasma discharge in this case is as an in-situ reformer, not a direct radical source. The verification is carried out by 0-D/1-D discharge/flame simulations along with subsequent experimental validations including GC sampling and hydrogen/air flame analyses.

Funding for the ME-EM Graduate Seminar Series is provided by Professional Plating, Inc. of Anoka, MN www.proplate.com