

COMBUSTION WEBINAR

Flame-pressure wave interactions and flame instabilities in vessels

Speaker: Huahua Xiao, University of Science and Technology of China

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Abstract: Understanding premixed flame dynamics in vessels or tubes is critical for a broad range of practical processes, such as explosions in confined regions and energy production in combustion engines. A premixed flame propagating in a vessel is intrinsically unstable due to physical phenomena such as fluid-dynamic or combustion instabilities, vortical flows, and pressure waves. Among these phenomena, flame-pressure wave interactions have a direct effect on flame instabilities and deserves further study. In this presentation, I will start by briefly discussing the process and observations of premixed flame propagation in vessels. Then, I will present high-order numerical simulations of flame instabilities arising from interactions with pressure waves generated by the flame itself. Particular attention will be devoted to the recently-discovered instability phenomenon “distorted tulip flame”. The presentation will show how we understand and quantify the pressure wave effects. Results, that address the influence of wall boundary condition on pressure wave generation/amplification and flame instabilities, will be also presented.

Biography: Dr. Huahua Xiao is currently a Professor in the State Key Laboratory of Fire Science at the University of Science and Technology of China (USTC). He received his PhD from USTC in 2013. Prior to joining USTC in 2018, he worked at the University of Maryland from 2014 to 2018. His research has focused on premixed flame dynamics, deflagration-to-detonation transition, blue whirls, numerical algorithm and model development, and hydrogen safety.

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