講演会のご案内

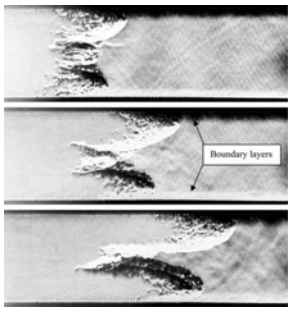
「２重円筒内の準デトネーション斜め反応面の形成と構造・

薄層形状内の火炎不安定性と DDT」

講師：Dr. Mike Kuznetsov カールスルーエ工科大学

日時：2016 年 10 月 14 日（金）13：30～15：00

場所：名古屋大学工学部２号館 3F 航空大会議室（３４７号室）



Kuzunetsov et al. Shock Waves (2005) 14 (3):205-215

カールスルーエ工科大学の Kuznetsov 博士は、デフラグレーションからデトネーションへの遷移(DDT)研究の世界的な第一者です。本講演では、回転デトネーションエンジン等にも応用可能な、あたらしいデトネーション構造や、火炎の不安定性に関して、最新の研究成果を発表していただきます。ご関心のある方はどなたでも、参加できます。以下は、Kuznetsov 博士から送付頂いたアブストラクトです。

① Formation and Structure of Quasi-Detonation Oblique Reaction Front in Annular Channel

The complex formed by an oblique shock wave and a subsonic deflagration, experimentally observed by the authors in an annular channel is investigated in this paper. The ensemble has the notable property of propagating with the Chapman-Jouguet velocity in the circumferential direction being of intrinsic subsonic nature. The structure is discussed in detail using an image processing and a theoretical analysis. Two mechanisms of very specific flame acceleration as a “knife” structure were proposed. For instance, a recently developed concept of flame acceleration within a boundary leading to detonation transition was compared against a mechanism of abrupt flame acceleration due to Mach reflection of advanced shock waves and its interaction with oblique reaction front in an annular structure.

② Flame Instability and DDT in a Thin Layer Geometry

An experimental study and theoretical analysis of 2D-flame instability in a mm-scale layer (2-10 mm) of hydrogen-air and hydrogen-oxygen mixtures was carried out in order to investigate the mechanism of initial quasi-laminar flame acceleration prior the DDT. An analysis with the Sivashinski-Michelson equation was performed in order to describe the experimental results and its dynamic development in terms of the basic physical properties of combustible mixtures. It was found, that the burning velocity increased by the factor of 1.2-1.5 due to the flame instability. This value was proportional to the flame area amplification rather close to the experimental data. The characteristic time of flame development with a cellular structure due to Landau-Darrieus instability was found to be much longer than the corresponding one for thermo-diffusion instability for lean mixtures. Also, we correlated the time required for instability development as a function of the mixture reactivity. An additional analysis of flame structure using image post-processing is also presented.

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