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transition (DDT) limits in H2-air mixture. Three geometrical configurations of obstacles spacing were considered: S = H, 2H and 3H, where H is the unobstructed channel height. The results showed that the DDT limits highly depends on the obstacles spacing. The widest DDT limits and higher velocities were observed for largest spacing. This effect is due to lower heat and momentum losses behind the lower number of obstacles where detonation diffracts. It has been shown that criterion of Dorofeev et al. [4] for successful transition to detonation is valid with relatively large margin for the geometry and mixtures investigated. The criterion of Thomas [11] has not been confirmed however, the analysis was based on the velocity of the leading shock wave velocity only. The measured experimentally time differencet between leading shock wave and following flame front points at the order of magnitude of ignition delay time that should be shorter to self-ignite the mixture before being consumed by the flame. Thet increases with the increase of spacing and therefore might partially explain the increase of DDT range.

45 - Effects of Unequal Blockage Ration and Obstacle Spacing on Wave Speed and Overpressure During Flame Propagation in Stoichiometric H2/O2

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Flame propagation and explosion behavior of hydrogen mixtures remain critical issues for explosion safety in nuclear power plants and refineries. Although extensive efforts have been made to understand the underlying mechanisms affecting flame acceleration and explosion severity in obstructed enclosures, most of the studies address obstacles with uniform distribution. This uniformity is characterized by constant obstacle spacing, shape, and blockage ratio, and may not be representative of the layout in actual industrial facilities. Therefore, the objective of this work was to investigate the influence of unequal area blockage and obstacle spacing on the leading shock wave speed and overall overpressure

during flame propagation. Experiments were performed in a closed pipe with 38-mm internal diameter and a total length-to-diameter ratio (L/D) equal to 73. Two ring-shaped obstacles with 5-mm thickness were used during each test. The arrangement between obstructions in the test vessel was changed in terms of blockage ratio (increasing, decreasing, and equivalent) and obstacle distance (1D, 2D, and 3D). Premixed hydrogen/oxygen mixtures at stoichiometric concentration were considered at 150 torr. The aim was to identify layout parameters that increase the overall overpressure and reduce run-up distance when detonation-to-deflagration (DDT) takes place. From the conditions tested, the increasing blockage ratio has a more significant impact on the overall maximum pressure and the run-up distance.

172 - Deflagration-to-Detonation Transition in Mixtures of the Pyrolysis Products of Polypropylene with Air

S. Frolov, V. Zvegintsev, V. Aksenov, I. Bilera, M. Kazachenko, I. Shamshin, P. Gusev, M. Belotserkovskaya

A new method for determining the detonability of a fuel is proposed: on the basis of the measured values of the length and time of the deflagration-to-detonation transition (DDT) in a pulsed detonation tube (PDT). Granulated polypropylene (GP) was used as a fuel. A test bench with PDT was designed and manufactured together with ;a gas generator for obtaining ;the pyrolysis products of GP at a decomposition temperature of up to 800 C. Experiments on the study of DDT in air mixtures of the GP pyrolysis products are conducted. It is shown that the pyrolysis products of GP have a detonability close to that of the liquefied petroleum gas (LPG) of the PBA (propane-butane automobile) ;brand ;in a stoichiometric mixture with air under normal conditions.

267 - Two-Dimensional Numerical Simulation of Flame Acceleration and Deflagration-to-Detonation Transition in Channels with Obstacles: Effects of Blockage Ratio and Chanel Size

K. Iwasaki, A. Ago, N. Tsuboi, K. Ozawa, K. Hayashi

This research investigates flame propagation and local explosions in channels filled with hydrogen/oxygen stoichiometric mixture and installed ten obstacles by using the two-dimensional simulation using a detailed reaction model. Furthermore, we estimate differences between the three-dimensional experiments performed in a past study and the present two-dimensional simulations. The simulations performed using the channels at one-twentieth the size of the experimental equipment with 5 m orthogonal grids for BR (blockage ratio) of 0. 06, 0. 12 and 0. 18, and the channel at one-tenth the size of experimental one with 10 m orthogonal grids for BR of 0. 18. As a result, higher