Influence of Pre-ignition Quasi-Isotropic Turbulence on Burning Velocity of Diethyl Ether /Air Mixtures

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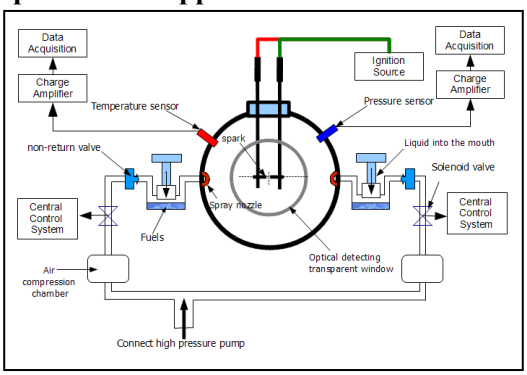
Abstract. This paper presents a detailed investigation on turbulent burning velocity of diethyl ether (DEE)/air mixtures under different pre-ignition quasi-isotropic turbulence. The concentration of DEE/air mixtures is the equivalence ratio ϕ = 1.1. The experimental result of the laminar burning velocity (u_L) is 0.55 m/s, and the largest data of turbulent burning velocity (u_t) are 1.8 m/s at pre-ignition quasi-isotropic turbulence velocity at 6.2 m/s. In this work the model gives the expression on the laminar burning velocity (u_L) and turbulent burning velocity (u_t) versus the pre-ignition turbulence velocity U_{rms} in accordance with Williams's theoretical model.

1. Experimental Apparatus and Procedures



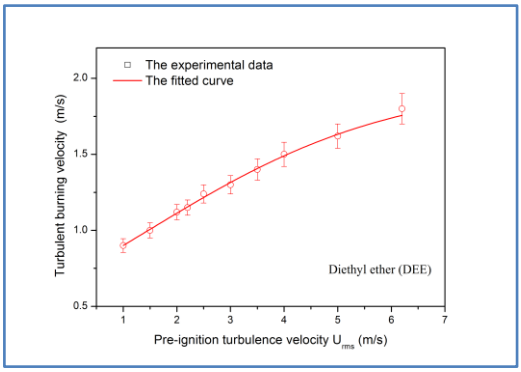


Figure 1. Schematic diagram of experimental set-up. **Figure** 2. Turbulent burning velocity (u_t) vs. pre-ignition quasi-isotropic turbulence velocity (U_{rms}) for DEE/air mixtures.

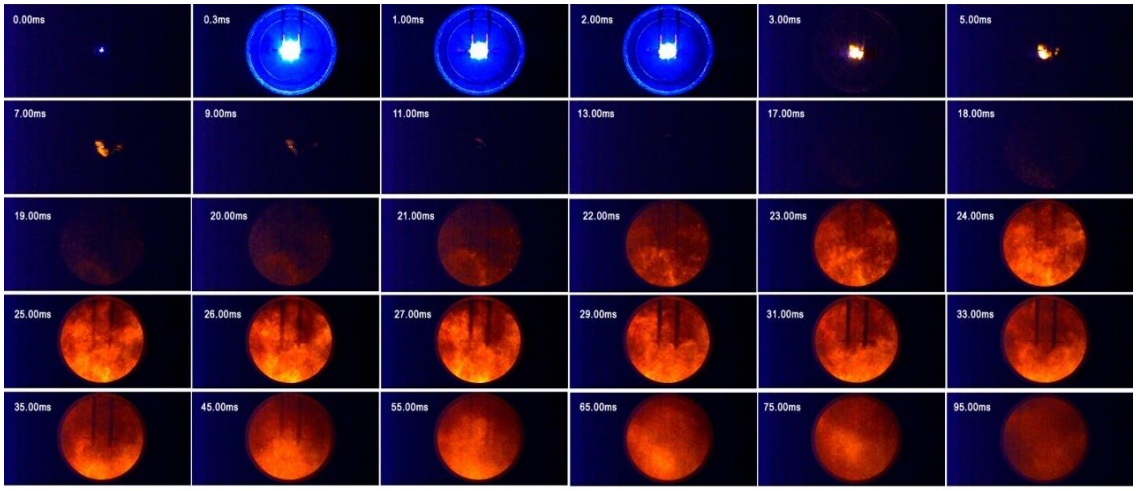


Figure 3. Ignition and flame propagation process under pre-ignition quasi-isotropic turbulence velocity ~4 m/s on DEE/air mixtures

2. Conclusions

(1) The experimental result of the laminar burning velocity (u_L) is ~0.55 m/s, and it is close to the result of ~0.54 m/s by Fiona Gillespieet al and ~0.52 m/s by Yage Diet al.

(2) The largest data of turbulent burning velocity (u_t) are 1.8 m/s at pre-ignition quasi-isotropic turbulence velocity at 6.2 m/s. In this work the model gives the expression on the laminar burning velocity (u_L) and turbulent burning velocity (u_t) vs the pre-ignition turbulence velocity U_{rms} in accordance with Williams's theoretical model..

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