An investigation into the heat release and emissions from counterflow diffusion flames of methane/dimethyl ether/hydrogen blends in air

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Supplementary Figures*:

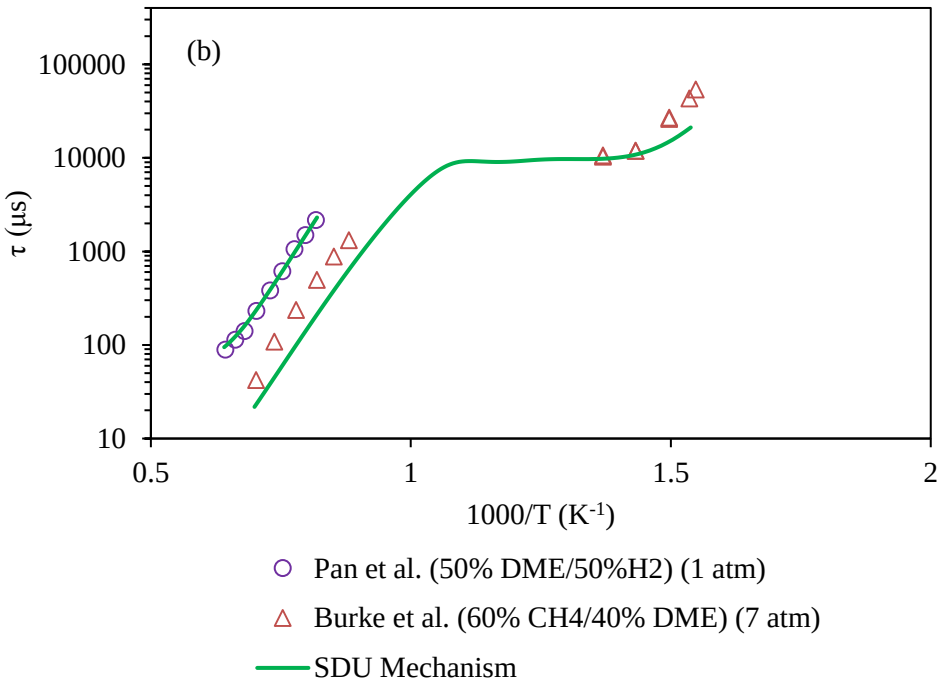


Fig. S1. Assessment of performance of the SDU mechanism in predicting the ignition delay time of 1:1 DME/H_2 and 3:2 CH_4/DME blends for different temperatures at stoichiometric condition. The experimental data are taken from [63,64].

* All reference numbers are according to the main manuscript

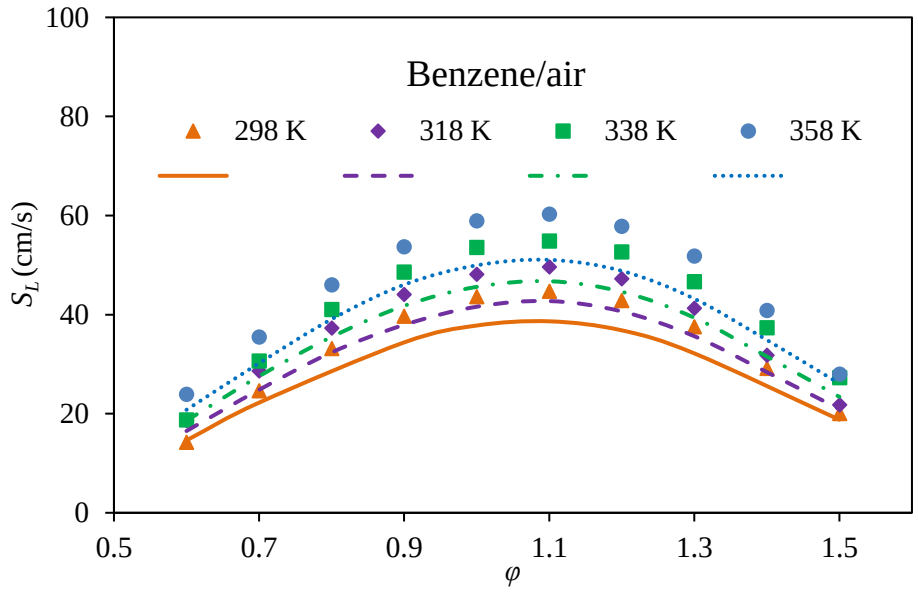


Fig. S2. Assessment of performance of the DUI mechanism in predicting the laminar burning velocity of C_6H_6-air mixture at atmospheric pressure and different unburnt gas temperatures. The experimental data are taken from [70].

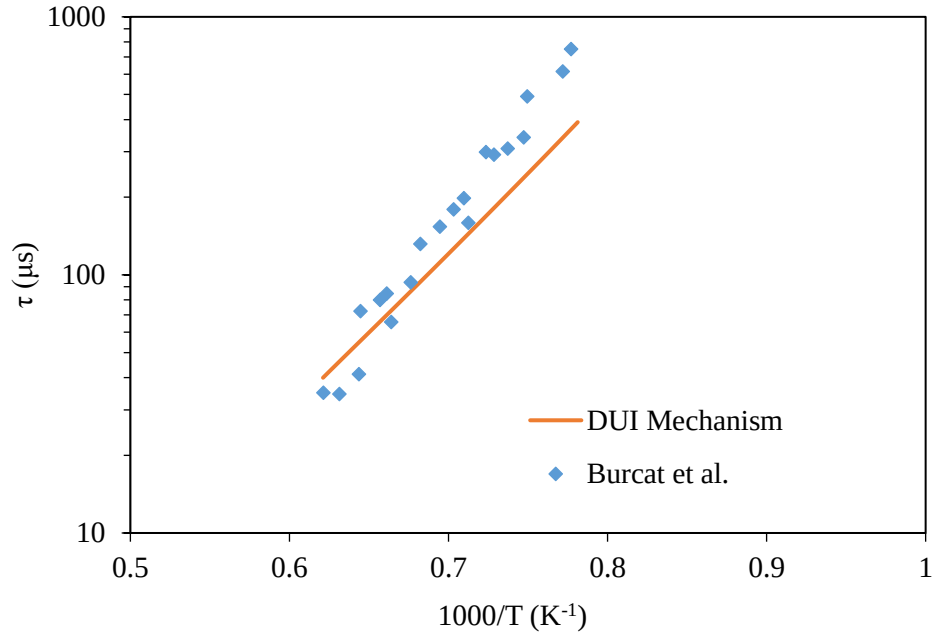


Fig S3. Assessment of performance of the DUI mechanism in predicting the ignition delay time of stoichiometric $C_6H_6/O_2/Ar$ mixture at 2.5 atm pressure and different temperatures. The experimental data are taken from [71].

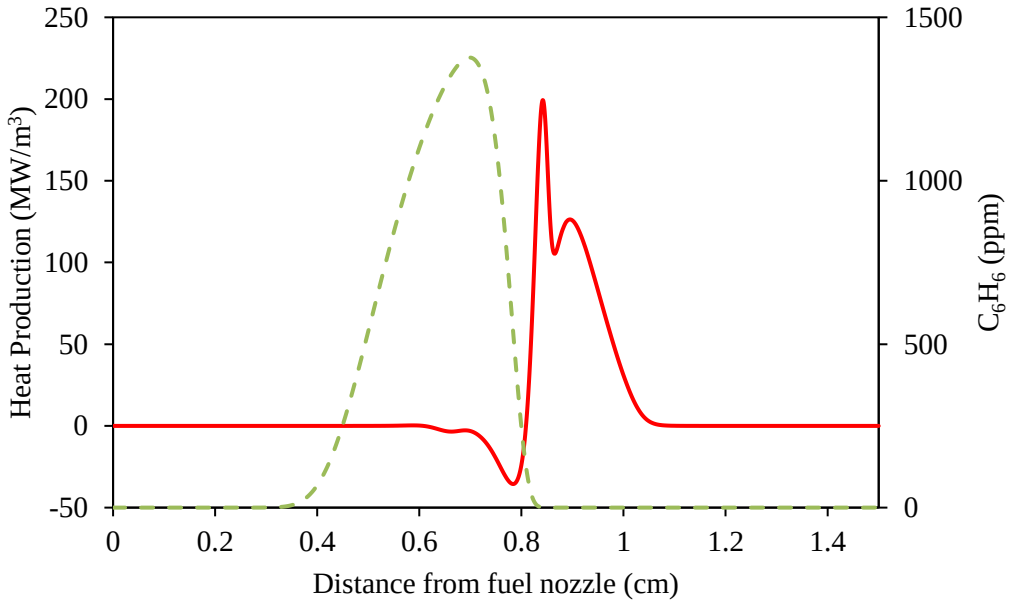


Fig. S4. Variation of C_6H_6 mole fraction (ppm) and heat production from gas phase reactions for counterflow diffusion flame of 90% CH4/10% DME blend in air across the computational domain. Air and fuel stream temperatures are 300 K and global strain rate is 34 s^{-1}.

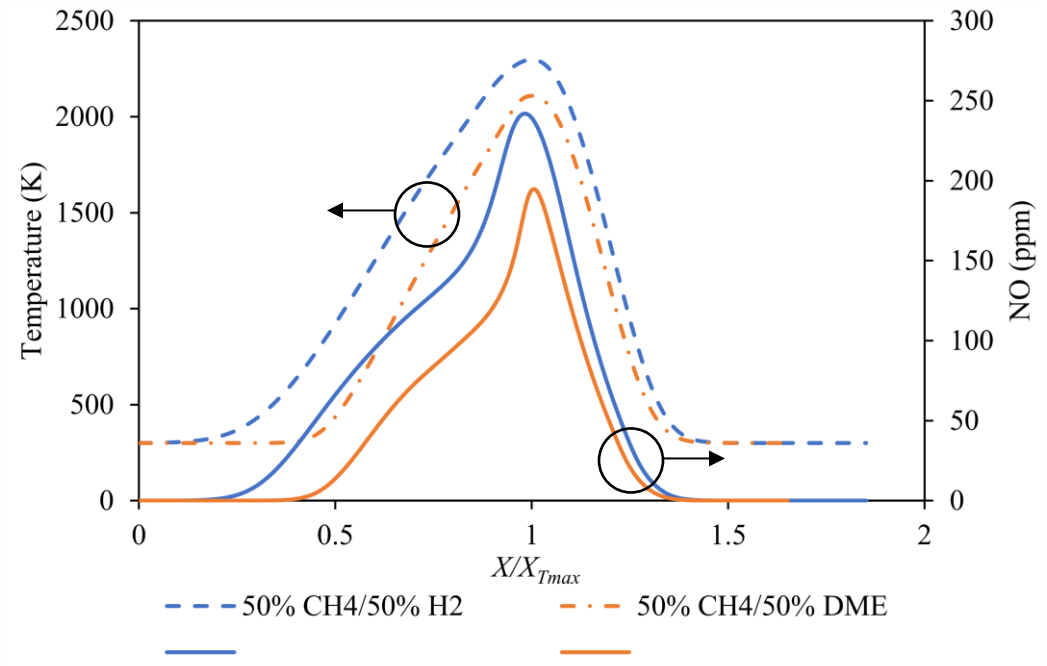
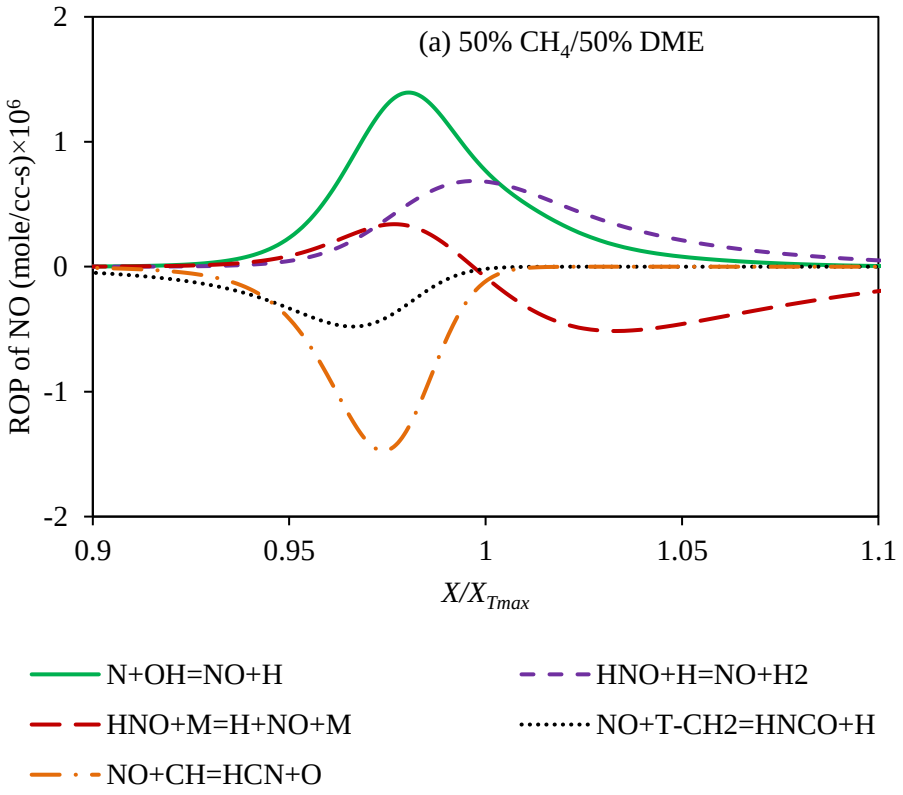
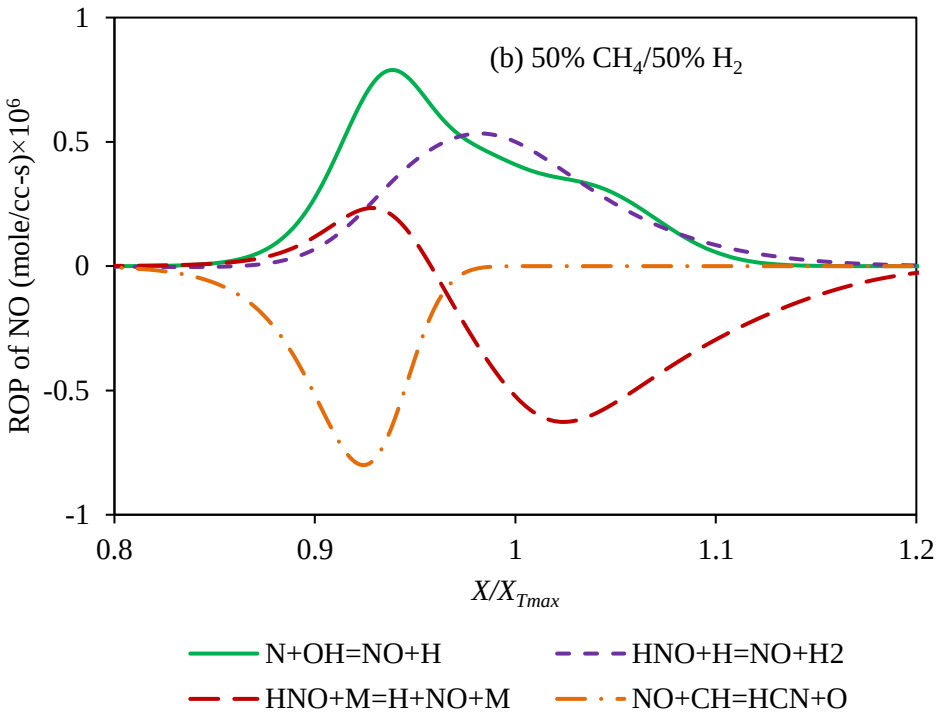


Fig. S5. Variation of temperature and NO mole fraction (ppm) for counterflow diffusion flames of 50% CH4/50% H_2 and 50% CH4/50% DME blends in air across the computational domain. Air and fuel stream temperatures are 300 K and global strain rate is 34 s^{-1}.


(a) 50% CH4/50% DME
ROP of NO (mole/cc-s)×10^6
2
1
0
-1
-2
0.9
0.95
1
1.05
1.1
X/X_Tmax
N+OH=NO+H
HNO+H=NO+H2
HNO+M=H+NO+M
NO+T-CH2=HNCO+H
NO+CH=HCN+O



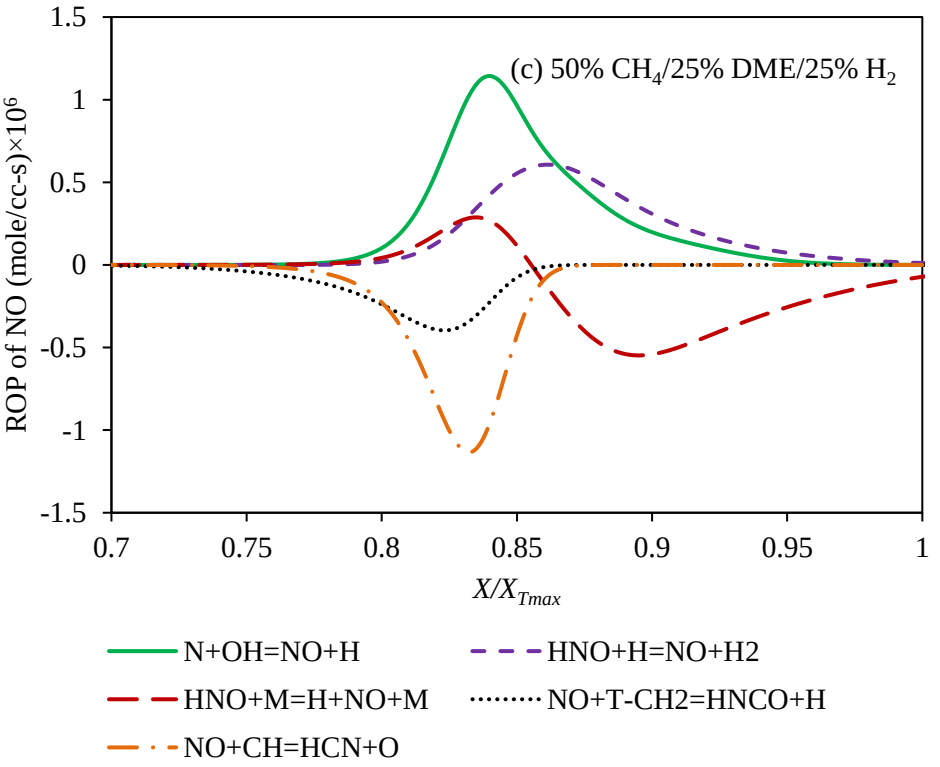


Fig. S6. Main contributing reactions towards production of NO for (a) 50% CH_4/50% DME (b) 50% CH_4/50% H_2 and (c) 50% CH_4/25% DME/25% H_2 blend.