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Instability of H2-O2-CO2 Premixed Flames on Flat Burner

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Abstract : The combustion of hydrogen-oxygen (H2-O2) mixtures was investigated to consider the reduction of carbon dioxide (CO2) and nitrogen oxide (NOx) as the greenhouse emission. Normally, the flame speed of combustion H2-O2 mixtures are very fast thus it is necessary to control the limit of mixtures with CO2 addition as H2-O2-CO2 combustion. The limit of hydrogen was set and replaced by CO2 with O2:CO2 ratio as 1:3.76, 1:4 and 1:5 for this study. In this study, the combustion of H2-O2 -CO2 on flat burner at equivalence ratio □=0.5 was investigated for 10, 15 and 20 L/min of flow rate mixtures. When the ratio of CO2 increases, the power spectral density is lower, the size of attractor and cellular flame become larger because the decrease of hydrogen replaced by CO2 affects the diffusive-thermal instability. Moreover, the flow rate mixtures increases, the power spectral density increases, the size of reconstructed attractor and cell size become smaller due to decreasing of instability. The results show that the variation of CO2 and mixture flow rate affects the instability of cellular premixed flames on flat burner.

Keywords : instability, H2-O2-CO2 combustion, flat burner, diffusive-thermal instability
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