
An investigation on the DME HCCI autoignition under EGR and boosted operation

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ABSTRACT

A numerical study was conducted to investigate the autoignition mechanism for controlling combustion phasing in a homogeneous charge compression ignition (HCCI) engine fueled with DME using zero-dimensional commercial software in a detailed chemical-kinetics model and continued experimentally using single cylinder compression ignition engine. The exhaust gas recirculation (EGR) and boosting method were applied to control the combustion phenomena. The results indicate that EGR addition slows down the decomposition of hydrogen peroxide (H₂O₂), which contributes to the amount of high temperature heat release by reducing the rate of hydroxyl radical (OH). Since too much EGR reduces the power and raises the carbon monoxide (CO), investigations focus on the autoignition characteristics of DME at boosting with EGR and their effects on variations of autoignition timings, combustion durations in two-stage combustion process in-detail using a contribution matrix to the heat release. It was found that longer duration of cool-flame with boosting due to increased oxygen concentration in the mixture, which finally enhanced the intermediate species reactivity but the duration of combustion dominantly depend on the EGR addition.

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