Experiment investigation on Influence of Oxygen concentration on NOx and CO emission

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Abstract

Nowadays, the air pollution is still a serious problem of the environment pollution. NOx emission of the industry combustion is the main source and it is hard to avoid. Aftertreatment which could reduce the NOx emission of the exhaust gas is high cost and might bring secondary pollution. In this research, a novel method of combustion named as Oxygen Diluted Partially Premixed and Oxygen Enriched Supplemental Combustion (ODPP/OESC) is proposed. The air is separated into two parts in the pretreatment, one is the Oxygen Diluted Air (ODA) premixed with the fuel and another one was Oxygen Enriched Air (OEA) for supplemental combustion. The core of this method is to organize the premixed fuel-rich combustion with the ODA and CH₄ to reduce the NO generation and the diffusion combustion with the OEA and unburned gas to finish the combustion. The relationship between the oxygen concentration of the ODA ($Y_{od}$) and oxygen concentration of the OEA ($Y_{oe}$) in different equivalent ratio of the premixed gas ($ER_p$) and total equivalent ratio ($ER_t$) was given and the adjustment range of operating parameters was discussed.

The effect of ODPP/OESC is estimated experimentally and the results showed that the CO emission was increasing with the NOx emission decreasing and the ranges of relatively low emission of both were $0.18 < Y_{od} < 0.19$, $0.26 < Y_{oe} < 0.35$ and $1.2 < ER_p < 1.3$. Farther experiments about the influence of independent operating parameters on NOx and CO emission were done and the results indicated that with the increasing of the $Y_{od}$, the NOx concentration increased and the CO concentration decreased at the fixed $Y_{oe}$ and $ER_p$. The same tendency of the NOx and CO changing with the $Y_{oe}$ was found at the fixed $Y_{od}$ and $ER_p$. But the NOx and CO concentration were both increased with the $ER_p$ at fixed $Y_{oe}$ and $Y_{od}$.