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Experimental Research On Effect Of Activating Temperature On Combustion And No_x Emission Characteristics Of Pulverized Coal In A Novel Purification-Combustion Reaction System

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Extended Abstract

A novel efficient and clean coal combustion system, namely the purification-combustion system, was designed by the Institute of Engineering Thermal Physics, Chinese Academy of Science in 2022. Among them, the purification system was composed of a mesothermal activating unit and a hyperthermal reductive unit, and the combustion system was composed of a mild combustion system. In the purification-combustion system, the deep in-situ removal of coal-N could be realized by matching the temperature and atmosphere in each unit, and thus the NOx emission was controlled effectively. To acquire the methods for realizing the efficient and clean coal combustion, this study investigated the effect of the activating temperature (including 822 °C, 858 °C, 933 °C, 991 °C), which was the key factor affecting the system operation, on combustion and NOx emission characteristics of pulverized coal in a 30 kW purification-combustion test bench. The research result turned out that the activating temperature affected the combustion and NOx emission characteristics significantly. As the activating temperature increased, the temperature increased first and then decreased in the mild combustion unit, and the temperature change in the lower part was much higher than that in the upper part. Moreover, the main combustion region was always located at the top of the unit under different activating temperatures, and the combustion intensity along the unit was weakened gradually. Increasing the activating temperature excessively could destroy the reductive atmosphere early in the upper part of the unit, which wasn't conducive to the full removal of coal-N in the reductive coal char. As the activating temperature increased, the combustion efficiency increased first and then decreased, while the NOx emission decreased first and then increased, illustrating that increasing the activating temperature properly promoted the efficient and clean coal combustion, but there was a limit to its growth. In this study, the optimal activating temperature was 858 °C. Hence, this research illustrated that increasing the activating temperature properly could realize the mutual matching of improving the combustion efficiency and reducing the NOx emission, and thus guaranteed the clean and efficient coal combustion well.