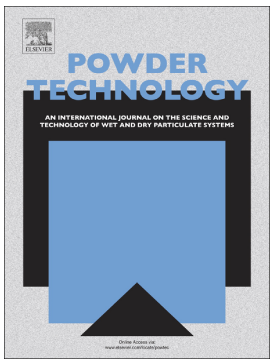

Effects of dust collection from converter steelmaking process on combustion characteristics of pulverized coal

Chong Zou, Hao Wu, Junxue Zhao, Xiaoming Li

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Effects of dust collection from converter steelmaking process on combustion characteristics of pulverized coal[1]

Chong Zou, Hao Wu, Junxue Zhao*, Xiaoming Li*,
（School of Metallurgical Engineering, Xi'an University of Architecture and Technology, Xi'an 710311, China）

Abstract: The effects of dust collection from steelmaking plants on the combustion characteristics of pulverized coal were investigated. Three influencing factors including the dust types, addition method, and addition amount of dust on the catalytic combustion were determined. Four types of basic oxygen furnace (BOF) dust can improve the combustion reactivity and combustion efficiency to different extents. The catalytic effects include that the ignition/burnout temperatures was decreased, and the maximum combustion rate and heat release were increased. A smaller particle size, larger BET surface, developed pore structure, and higher amount of CaO in BOF dust are beneficial for improving the catalytic effects on coal combustion. When increasing the addition amount, the catalytic effects on coal combustion first increased and then decreased with an optimum rust-to-coal ratio of 1:30. The addition methods have significant effects on catalytic combustion. The mixture prepared through grinding after blending showed better combustion reactivity than that prepared through blending only, and the suspension blending displayed was better than that of dry blending. The pollutant gas evolution including CO and SO_2 during coal combustion was suppressed by adding BOF dust, and the CO_2 evolution was promoted owing to the transformation of CO into CO_2.

Key words: Blast furnaces; Pulverized coal injection; Steelmaking; BOF dust; Combustion reactivity

1. Introduction

In 2016, China's crude steel production reached 808 million tons, accounting for 49.6% of the world's annual total. The metallurgical dust and sludge invariably generated in integrated steel plants makes up nearly 10% of crude steel production. Hence, about 80 million tons of metallurgical dust and sludge is produced in steel plants in China. Among the different types of metallurgical dust, 16.16 million t/a of BOF dust has been collected in China through the converter steelmaking process. In the USA and Canada alone, BOF dust is the second largest solid-waste residue generated by integrated steel mills at over 2 million t/a [1]. The composition of BOF dust varies widely depending on the smelting technology applied, but the material usually contains some useful resources, including an average of 40% iron, 10% calcium, and 4% magnesium, which can be recovered and reused in the iron and steel making process.

* Corresponding author at: School of Metallurgical Engineering, Xi'an University of Architecture and Technology, Xi'an 710311, China. Tel.: +86 13572459737
E-mail addresses: zhaojunxue1962@126.com (J. Zhao), xmli88@126.com (X. Li).