Physico-chemical profile of $PM_{2.5}$ emitted from iron ore sintering process and emission reduction suggestions

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Abstract: Controlling the emission of $PM_{2.5}$ (particulate matters with aerosol dynamic diameter ≤2.5μm) from sintering flue gas is of great significance for green iron & steel manufacturing. This investigation mainly focused on the physicochemical emission profile of $PM_{2.5}$ and proposed some suggestions for abating $PM_{2.5}$ emissions as well. Results showed that $PM_{2.5}$ characterized high emission concentration in special sintering areas from sintering stage-4 to stage-5, which corresponded to the later part of the whole sintering process, while it exhibited considerably low emission concentration in former part of sintering stage-1 to stage-3. The chemical composition of $PM_{2.5}$ from former part characterized high contents of Fe, Ca, Al and Si, while they were K, Pb, Cl and S for $PM_{2.5}$ from the later part. Consequently, the $PM_{2.5}$ emitted

from later part posed greater threat to environment for its high heavy (alkali) metals, and it was even more difficult to be removed by electrostatic precipitators due to its excessive resistivity. Based on revealed properties, in-bed and end-of-pipe emission reduction suggestions were proposed. Taking the intensive emission property of $PM_{2.5}$ consideration, strengthening the absorption capacity of sintering bed through spraying binder solutions can be the potential in-bed reduction technique, with its main purpose to trap the $PM_{2.5}$ from flue gas when passed downwards in sintering bed. As for the excessive resistivity of $PM_{2.5}$, spraying conditioning reagents into flue gas from later part for lowing resistivity of $PM_{2.5}$ is the potential end-of-pipe measure for efficient $PM_{2.5}$ reduction, with its main purpose to regulate the resistivity of $PM_{2.5}$ to the required range of electrostatic precipitators.
Keywords: Iron ore sintering; $PM_{2.5}$; Physico-chemical profile; Controlling suggestions