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Atmospheric aerosols around three different types of coal-based industries: Emission parameters, cytotoxicity assay, and principal component analysis

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Abstract

The present paper describes a comparison of the air quality and aerosols emission parameters around tea processing, coke oven and brick kiln industries that use high sulphur coals in their processes. The concentrations of gaseous species (SO_2, NO_2, and NH_3) and aerosols ($PM_{2.5,}$ PM_{10} and TSPM) along with the physico-chemical properties (Moisture, Ash, Volatile Matter, C, H, N, TS) of the feed coals are compared for these industries. The concentrations of the gases e.g. SO_2, NO_2 and NH_3 emitted are observed to be higher in the coke oven and tea processing industries in comparison to the brick kiln industry. The mean PM_{10} and $PM_{2.5}$ concentrations are found to be higher in the tea processing industry A, followed by the coke oven, tea processing industry B and lastly the brick industry. The Cytotoxicity (MTT) assay of the aerosols was performed for their risk assessment. Source apportionment was carried out by using Principal Component Analysis and a high factor loading was observed in Factor 1 with 58% total variance and was associated with the secondary aerosol sources.