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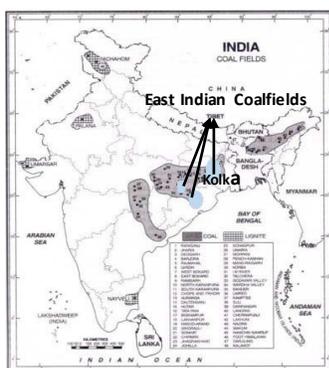
Variability of Pb-isotopes in the East Indian Gondwana Coal deposits: its influence on Kolkata street dust

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Lead (Pb) isotopic ratios (IR) act as a powerful tracer for the global atmospheric Pb dispersal derived from natural as well as anthropogenic sources. Depending upon the geological origin, Pb has a characteristic isotopic composition, and this unique property is used to trace lead sources in the environment [1]. Since the phasing out of leaded gasoline from India in the year 2000, coal combustion remains the principal source of Pb and mercury pollution in the environment, which in turn is responsible for severe health problems in the Indian scenario [2]. The present work aims at the measurement of high precision Pb isotope ratios by Multi-Collector ICPMS housed at Geological survey of India, Kolkata, of coals from different major coal bearing Gondwana basins in the eastern part of India. Explicitly, this data set, which is being worked out for the first time from Indian Coals, would contribute to establish a background for identifying relative contribution of coal, especially those used in coal-based thermal plants for the lead pollution in India.



Indian Gondwana coal occurs as seams inter-banded with sediments. They typically have high ash content (35–50%) which makes them a potential heavy pollutant, considering that very large quantity of coal is burnt for thermal power plants, smelters etc. Sixty coal samples from different seams occurring in the major East Indian Gondwana coalfields, that are primarily used for thermal power plants, namely, Jharia, Raniganj, Talcher and Pb have been analyzed for their isotopic composition, as well as the content of Pb. The results indicate high variability of coals from Gondwana basins of eastern India in terms of their concentration and Pb-isotopic ratios.

Fig.1: Coalfield map of India showing the East Indian Gondwana Coalfield.

The Pb-content varies from 37-440 ppm with an average content of ~238 ppm. The ranges of isotopic ratios of Pb are as follows: 206/207 Pb IR = 18.39858 -20.24614, 207/204 Pb IR = 15.67247 -16.29966; 208/204 Pb IR = 38.48078 -41.61838; 206/207 Pb IR = 1.173943 -1.24897; 208/206 Pb IR = 2.00667 - 2.16055. The analyses has been carried out using sample - standard bracketing technique where the SRM 983 has been used as standard. The high variability in Pb content and its isotopic composition is likely due to high and variable ash content of the coal seams including its pyrite content. However, within a seam Pb-isotopic ratios vary within a narrow range. It might be worth noting that these data compares well with the records from the Chinese coals that have Pb- content varying 40-400 ppm with a 206/207 Pb variation of 1.140–1.208 and 208/206 Pb values of 2.1007 ± 0.0298 [3], [4]. Preliminary data on Pb-isotope variations in the street dust and food items of Kolkata reveal that they are influenced by contributions from coal burning in thermal plants, as has been reported by Das et al. [5]. From these data and similar data reported in Chinese studies, it can be concluded that coal combustion is a significant contributor to environmental Pb.

References:

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