

Macerals and trace elements of the selected Permian Coal of India

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SUMMARY

The coal plays an important economic role in the energy equation of India as it provides 70% of power requirements for one of the fastest growing economy in Asia. The Permian coal represents 99% of thermal and coking coal of the country, and it is expected to dominate as the low cost and reliable energy source in comparison to rising price of the imported oil and gas. The geological setting, maceral distribution and trace elements distributions of major and moderate concerns are presented in the paper.

Key words: Coal, Permian, Macerals, Trace elements

INTRODUCTION

The Permian coal of India is often described as Gondwana Coal, named after an indigenous "Gond" tribe of the state of Jharkhand in eastern India. This coal represents 99% of the thermal and coking coal of India, and in global scale the reserves of coal are 8.6 % for a population of 1.1 Billion. The annual production of 300MT of coal in 2001 is expected to rise to 560 MT by the end of 2010, IEA (1997). Future coal utilization as an energy source is conditional upon the development of cost effective technologies and uses in environmentally sustainable way. The understanding of distribution of organic (macerals) and inorganic (mineral matter and trace elements) components is of great importance in meeting the challenges, as there are usually long term lead times for technology development and its application in comparison to shorter lead times for policy shift, as is the case in meeting Kyoto Protocol targets on greenhouse gas emissions. India along with China is signatory to the Kyoto Protocol, however they do not have to comply with the targets due to being developing countries. Due to the importance of coal in their energy equations both India and China are signatory along with the other four USA, Australia, Japan and South Korea to the July 2005 agreement, the Asia-Pacific Partnership on Clean Development and Climate, which, it is claimed would bring emissions down through technology, as these countries are not willing to sacrifice export import coal based economy in order to meet the Kyoto Challenge.

GEOLOGICAL SETTING

The Permian coal bearing basins in peninsular India occur in three distinct belts of the present river valleys of Narmada-Son-Damodar, Pranhita-Godavari and Mahanadi. These valleys cover parts of the states of Madhya Pradesh, Bengal,

Bihar, Chattisgarh, Maharashtra, Andhra Pradesh, Orissa and Jharkhand in India. The Permian sequences are described as Lower Gondwana and the Upper Gondwana Formations. The Lower Gondwana Formations namely Barakar and Raniganj successions are coal bearing. These successions have earlier been interpreted as fluvial, however on the basis of sedimentological studies of Ghosh et al (2004); the tidal influence has been recorded for the coal bearing Barakar Succession.

MACERALS AND TRACE ELEMENTS

The Permian Coal has subdued lustre due to the presence of fine laminations of less than 1 mm thickness and associations of finely dispersed mineral matter with dull, dull banded and bright lithotypes. The macerals of vitrinite and inertinite group are dominant and the macerals of exinite group are in minor proportions. The mineral matter, sulphur and ash contents are high in comparison to Permian Coal of Australia. On the basis of organic petrography data published by Babu (1968), Pareek (1986), Mishra (1990) and Singh (2001), the vitrinite contents range from 19% to 55%, with the vitrinite reflectance range between 0.51% to 1.05 %, which places the coal in the rank of sub-bituminous A to C to high volatile bituminous as per the Australian Coal Classification. The exinite content in the coal has a range between 7 % to 28% and the inertinite content ranges between 10 % to 32 %. The mineral matter content in the coal has a range between 10 % to 40%, and majority of minerals are clays, sulphides, carbonates and silicates. According to Singh (2001), the trace elements of major and moderate concern in the Lower Turra Seam of Permian Singrauli Coal of the Moher Sub-basin, Jharkhand has lower concentrations in comparison to Upper Three Seams of the sub-basin. The distribution of trace elements in the coal is of environmental importance as about 40 MT of coal will be utilized on annual basis for the super thermal power station utility in the area.

DISCUSSION

The trace elements associations with macerals, along with ash and sulphur in the Permian Coal are contaminants and pollutants of environment during the utilization of coal. The utilization of coal in fast developing economy of India is on the increase, as evident from the July 2005 Asia-Pacific Partnership on Clean Coal Technology Development and Climate, signed by the major producers and users of coal including India.

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