

Turbostatic structure of aromatic layers in Tipong coal: An X-ray scattering study

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Abstract : Coal sample collected from Tipong area (of 60' depth) from North-East India was studied using X-ray scattering technique. This report is an attempt to understand the size of the average polycyclic aromatic unit in Tipong coal. The average stacking height of the parallel aromatic layers (L_c) and the average diameter of the aromatic layers (L_a) are estimated to be 8.250Å and 4.830Å respectively. For this coal the average number of stacking layers and the average number of atoms per layer are estimated to be 2 and 8 respectively. In addition, the gamma band is observed at a d-value of 4.837Å.

Key words: Tipong coal, aromatic layers, Gamma band

Introduction

Coal is a heterogeneous substance on both a macroscopic and microscopic level and it consists of macromolecular and low-molecular phases. The basic diffraction studies on coal structure were carried out many years ago. The diffuseness of the X-ray pattern of coal has been attributed to particles in which the arrangement of carbon atoms is that of a graphite crystal, but with extremely small size of the elemental crystallites (Lowry, 1963; Haenel, 1992). The diffused lines are characterized by terminating sharply on the low-angle sides, but falling off gradually in intensity on the high-angle sides. Such reflections are produced characterized by two-dimensional lattices (random layer lattices). This sheet like crystals of negligible thickness tend to accumulate in parallel groups in which the adjacent sheets have no fixed orientation with respect to each other except that they are mutually parallel. This coal possess a "turbostatic structure" (Warren, 1941; Biscoe & Warren, 1942; Lowry, 1963; Haenel, 1992; Heek, 2000), which means that coal contains stacked aromatic