

PETROGRAPHIC STUDY OF LEKHAPANI COAL : AN X-RAY SCATTERING ANALYSIS

D.K.Kalita¹, R.K.Boruah^{*2} and N.C.Dey²

1. P.O.W.I.E.T, Jorhat-785001, Assam, India

2 North East Institute of Science & Technology, Jorhat, 785006, Assam, India

Abstract

Coal sample collected from Lekhapani area, Assam was studied using XRD. Random layered structural values for mean Lamellae diameter (La) and crystallite size dimension (Lc) were found to be 22.33 and 8.4Å respectively. The position of γ -band was found to be 4.18 Å. The average number of atoms and no. of layers as determined by X-ray method were found to be 23 and 2 respectively.

Introduction

Coal is made up of heterogeneous materials consisting of macromolecules of high molecular weight. Its composition varies with places of occurrence and its structure changes with its matrix. It is, however, to be noted that if the present energy crisis trend is continuing then as time passes coal, one of humankind's primary energy sources, will continue to play dominant role as a source of commercial energy in the country for many years to come. The role of coal for development is remarkable. It has also potentiality for inter-fuel substitution in replacing oil. The proposed work will be very much helpful with great success to investigate the mechanism of pyrolysis, hydrogenation and hydro cracking reaction including the formation of the products and their control by experimental conditions and catalysis.

The basic diffraction studies on coal structure were carried out many years ago (1-10). The diffused lines of the x-ray pattern of coal 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 by two-dimensional lattices i.e. 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 structurally parallel. Thus coal possess a "turbostatic structure", which means that coal contains stacked aromatic layers which are roughly parallel and equidistant but with each layer having a completely random orientation in plane and about one layer normal. The dimension of these domains are characterized by the average stacking height of the parallel layers in the c-direction (Lc) and by the average direction of the parallel layers in the 'ab' plane (La).

Coal from Lekhapani area of Makum coalfield has been classified as sub-bituminous type on the basis of the studies on their chemical composition and physical characterizations. The present work is concerned with the average stacking height of the parallel aromatic layers in the c-direction (Lc), the average diameter of the parallel aromatic layers (La), total numbers of the layers and total numbers of carbon atoms present per layer etc. using X-ray scattering analysis.

Experimental

The coal sample was collected from Lekhapani area of North-Eastern Coal field of India and grounded to 200 mesh (BSS) before use. Diffraction data were obtained using computer controlled X-ray diffractometer Type JDX-11P3A, JEOL, JAPAN, attached with pulse height analyzer and scintillation counter with scintillate NaI (T1) single crystal. Measuring condition, Mode : Step, KV : 40, Start angle : 2.0, Target : Cu (Fe- filtered), mA : 20.0, Stop angle : 110.0, Measuring time : 0.5, step angle : 0.05 and Data processing condition : Smoothing points : 7, Background step : 20, Peak width : 0.2, correct : 0.0, Smoothing time : 5, Background time : 5, Goniometer radius (R) : 170 mm.

Contact No. 9435489164 *corresponding author