

X-ray Diffraction Studies of Indian Coals

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X-ray Diffraction (XRD) technique is widely used for characterization of minerals and organic material of coals. XRD is initially used for determination of mineral matter during the last century but presently it is also used for determination of molecular structure of India coals.

Characterization of mineral matter was persuaded for almost all the coal fields of India and it has been observed that Indian coals contain mostly detrital minerals namely quartz, kaolinite, illite, montmorillonite, feldspar, hematite, magnetite etc and some authigenic minerals like calcite, gypsum, siderite etc are also present. For last several years, quantitative estimation of the mineral matter is being carried out using the software SIROQUANTTM of M/s Sietronics Pty Ltd. Australia. Predominance of the detrital minerals like quartz and kaolinite and geological setting of the coal deposits lead to the detrital origin of Indian coals. The data bank for Indian coals has been upgraded with the mineral matter and their quantification results.

Recently, several Indian coals of different rank have been studied by wide angle X-ray scattering and X-ray structural parameters namely d_{002} , L_c , and N_c and f_a are determined for raw and chemically modified coals by a semi-quantitative method.

Coals of different rank have been treated with nitric acid in aqueous and glacial acetic acid media for assessing the changes in the structural parameters. The treatment of coal with nitric acid in aqueous and non-aqueous media introduces changes in the chemical and spatial structure of the organic mass. Studies reveal that coal consists of a semi-crystalline turbostratic structure and high background of the diffraction profiles clearly shows that coal contains amorphous carbon into its structure. Considerable variation of the structural parameters has been observed with respect to the raw coals. The d_{002} values have decreased in aqueous medium but increased in acetic acid medium; however, L_c , N_c , and f_a values have increased in aqueous medium but decreased in acetic acid medium. Disordering of the coal structure increases in acetic acid medium, but a reverse trend is observed in the aqueous medium.