

FUEL SCIENCE

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Thrust Areas

Structure - Behaviour relationship of Coal

Correlations have been established between rank property and elemental composition of coal. These correlations can be employed for the evaluation of intrinsic properties like gross calorific values, distributions of types of carbon, disposition of hydrogen moisture and V.M. of Coal

Industrial behaviour like relative proneness of auto oxidation and spontaneous combustion, weathering of coals, carbonization property including the quality of cokes can be predicted. These correlations can further be extended for formulation of blending of coking coals to attain desirable coke qualities.

Computer aided molecular modelling

Molecular models for coals at discrete rank levels have been established and validated against standard experimentally determined parameters using the software Hyperchem Molecular Modeller.

Structure Analysis of Coal

Methods, infrastructure and expertise have been established for complete structural analysis of coal.

Direct hydrogenation of coal

Direct hydrogenation of coal is a major activity of this Institute. Besides studying the basic aspects related to coal hydrogenation and reactions kinetics and mechanism, new concept named "Multistage Hydrogenation of Coal" using steam has been established. The novel features of this process are its high conversion ~85% or more with respect to coal, better recycle solvent quality - practically free from PA & A. Low H₂ consumption and comparatively lower pressure - maximum 130 kg/cm² hot hydrogen pressure.

Upgradation of Petroleum heavy residue

Heavy residue from petroleum [80% above 600°C] have been converted to a product slate consisting of 10% gasolene, 30% middle distillate of 30% vacuum gas oil range product without any coke formation. The process is operated at atmospheric pressure. The upgradation does not require any gaseous hydrogen input and employs steam under some specified conditions in presence of throw away catalyst.

Characterisation facilities for tar & similar coal derived products.

Method, infrastructure and expertise are available for characterisation of tar & similar products into groups like acidic, basic, neutral nitrogen, saturates, monoaromatics, diaromatics & poly aromatics.

Disposition of sulfur functional groups in coal

Methodologies and expertise for the quantitative estimation of various sulfur functional groups present in coal have been established. Expertise are also available for the desulfurisation of the high sulfur lignite/ coal using various physicochemical techniques.

Primary volatiles of coal

Quantitative estimation of primary volatiles of coal was established for judging its suitability towards combustion in a thermal power plant.

Other Facilities Available

- *FT-IR for Functional Group Detection & Estimation*