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Petrographic Characteristics of the Low Sulphur Coals from the Campanian-Maastrichtian Mamu Formation, Anambra Basin, South East Nigeria

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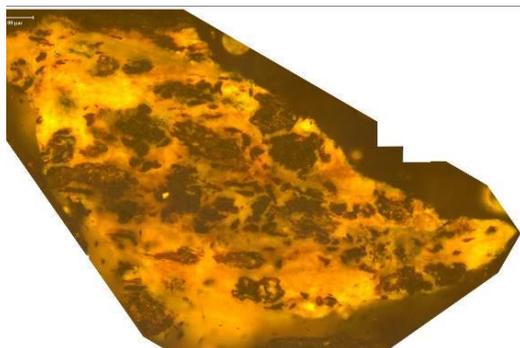
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More than 80% of the Nigerian population lack modern electricity supply and access to clean cooking fuels [1]. This is a major challenge for a growing economy like Nigeria. Coal resources must be front and centre in solving the energy poverty crisis. Coal mining in Nigeria has long been abandoned and coal resources have been considered as a forgotten fossil fuel. Recently government policy is encouraging the utilization of coal resources to boost the country's electricity generation and provide feedstock for producing coal briquettes to replace wood for cooking, domestic and industrial uses. Therefore, it is necessary to evaluate the character and properties of the Nigerian coals and assess their potential as sources for steam generator for electricity supply and briquettes for domestic and industrial smokeless fuel [2].

A set of seven (7) sub-bituminous coal samples derived from the Upper and Lower Coal Measures from the Onyeama, Opara and Okaba mines, and 1 lignite coal from outcrops at Obomkpa, were subjected to petrographic and geochemical analysis. The Lower Coal Measures comprise alternating shales, sandstone, and coal seams and carbonaceous shale at certain horizons. The thickness of the coal varies between <1.0– 3.5 m with an average thickness of 2.10 m. The carbonaceous shales are fissile and grey to dark brown in colour with an odour characteristic of organic debris. The dark colour of the shale may be attributed to a high organic matter content, which may suggest a reducing environment during deposition.



Petrographically all the coal samples are dominated by vitrinite (45.6-69% mmf) with desmocollinite and detrovitrinite being the most common maceral. Liptinite contents range from 7.3-34.2% mmf) with sporinite as dominant maceral in all samples. However, the Obomkpa lignite sample contains relatively high abundance of resinite (9.9% mmf), while subbituminous coal from the Lower Coal Measures has traces of resinite and suberinite.

Figure 1: Photo micrograph showing good variety of Resinite

The vitrinite reflectance values range from 0.41 to 0.51% R_r. Geochemically the coals range in ash yield from 4.2% to 8.3% (dry) and in total sulphur content from 0.54% to 0.73% (dry). The volatile matter content varies from 31.7 to 39.9% (dry). On heating under pressure, the subbituminous Onyeama coals yielded tar and light oil (17.7 wt. %) and gas (10.0 l/100g). The softening point in the dilatometer test ranges from 356 – 380°C. The high percentages of vitrinite observed in these samples are suggestive of

peat accumulation in a deltaic swamp with a persistent reducing environment. The relatively low ash yield suggests that the peat swamp was intermittently disturbed by sediment supply. The gross calorific values of the coal samples (as received) range from 5,098 to 6,628 kcal/kg. Since liptinite is relatively resistant to thermal breakdown, the Maastrichtian coals with lower values of liptinite provide good feedstock for steam boiler for electricity generation.

References:

- [1] Laditan, G. O. A. (1996) In: Nigerian Coals 174-193.
- [2] Mkpadi, C. A. (1996) In: Nigerian Coals, 194-214

