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Variation of coal petrographic composition on either side of the Tshipise fault, Soutpansberg coalfield, South Africa

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The basis of this research is to understand coal composition and petrographic variations in samples from the Soutpansberg Coalfield, Limpopo Province, South Africa. The Soutpansberg is preserved within extensive horst and graben systems. In the area, faults exert a major structural control. There are three notably major faults in the Soutpansberg coalfield, that is: Klein Tshipise, Tshipise and Bosbokpoort.

The Tshipise fault is an ENE-SWS trending fault. On the southern side of the fault, the coal exhibits a higher mean vitrinite reflectance value and exhibits coking properties; whereas on the northern side of the fault, the coal exhibits a lower mean vitrinite reflectance value with limited coking properties. Petrographic analyses, proximate, total sulphur, X Ray Diffraction (XRD) and Free Swelling Index (FSI) analyses were conducted on samples from Coal of Africa Limited's Makhado project area in the Soutpansberg Coalfield. The petrographic analyses were carried out using a Zeiss Axio Imager M2M retrofitted with Hilgers Diskus Fossil software for reflectance and maceral analyses, at a magnification of x500 under oil immersion. The samples are scanned automatically and analysed offline using the Fossil Student software.

The studied coals were characterized by relatively high ash, total sulphur, and volatile matter contents, and low moisture and calorific values. The maceral analysis indicated that the coal is rich in vitrinite, with low inertinite and very low liptinite contents; this is characteristic of the Soutpansberg coal. Although the vitrinite is high, pseudovitrinite is present, which is known to affect coking properties. The rank of the coal on either side of the fault is Medium Rank C, but the mean reflectance values range from 0.76-0.90 in the north and 0.80-0.95 in the south. The mineral matter identified in the coal is clay, quartz, siderite and pyrite.

Samples from the northern side of the fault had relatively high mineral matter, high total sulphur, and ash, with syngenetic pyrite being the most common mineral. On the southern side of the fault, the coal is rich in silicates and has a slightly higher siderite composition; pyrite observed is epigenetic with some traces of syngenetic pyrite. XRD studies on the coal confirm the mineral matter identified by petrography, but also shows the presence of dolomite and ankerite minerals. High FSI numbers were found to be associated with samples that had high volatile matter, lower ash content and higher calorific value.

