Application of Acid Base Accounting to Predict Post-Mining Drainage Quality in Coalfields of the Main Karoo Basin and Selected Sub-Basins, South Africa

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Abstract : Acid Base Accounting (ABA) is a tool used to assess the total amount of acidity or alkalinity contained in a specific rock sample, and is based on the total S concentration and the carbonate content of a sample. A preliminary ABA test was conducted on 14 sandstone and 5 coal samples taken from coalfields representing the Main Karoo Basin (Highveld, Vryheid and Molteno/Indwe Coalfields) and the Sub-basins (Witbank and Waterberg Coalfields). The results indicate that sandstone and coal from the Main Karoo Basin have the potential of generating Acid Mine Drainage (AMD) as they contain sufficient pyrite to generate acid, with the final pH of samples relatively low upon complete oxidation of pyrite. Sandstone from collieries representing the Main Karoo Basin are characterised by elevated contents of reactive S%. All the studied samples were characterised by an Acid Potential (AP) that is less than the Neutralizing Potential (NP) except for two samples. The results further indicate that the sandstone from the Main Karoo Basin is prone to acid generation as compared to the sandstone from the Sub-basins. However, the coal has a relatively low potential of generating any acid. The application of ABA in this study contributes to an understanding of the complexities governing water-rock interactions. In general, the coalfields from the Main Karoo Basin have much higher potential to produce AMD during mining processes than the coalfields in the Sub-basins.

Keywords : Main Karoo Basin, sub-basin, coal, sandstone, acid base accounting (ABA)
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