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School of Environmental Sciences  
Department of Mining and Environmental Geology

***Characterization of potential acid leachate from raw  
coal, discard coal and slimes from Mafube Colliery:  
A replication to a proposed new extension,  
Mpumalanga Province, South Africa***

By

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## ABSTRACT

Anglo Coal and Eysisizwe Coal plan to extend mining activities at the Mafube Colliery, Springboklaagte, Arnot North coal reserves. However, an integral part in every mining development project is the consideration of environmental impacts, particularly, the generation of acid mine drainage. Integrated geochemical and mineralogical study was conducted on raw coal, discard coal and slimes from the Mafube Colliery, to characterize the potential of acid leachate and also to quantify the quality of leachate from the samples. Bulk chemical and mineralogical analyses were done by means of X-ray fluorescence spectrometry and X-ray diffraction. Total sulphur and carbon content were determined by means of LECO induction furnace.

Raw coal was found to contain 0.4% of sulphide sulphur, predominantly as pyrite; 27% quartz and 73% kaolinite. Discard coal was found to contain 5% of sulphide sulphur as pyrite, and up to 80% of clay minerals such as kaolinite, as well as quartz and calcite (1%). Furthermore, raw coal contained 62% of carbon, whereas discard coal had only 29% carbon. Static tests were performed by means of acid base accounting procedures (ABA) to measure the theoretical potential of samples to generate and consume acid. Raw coal and slimes were found to be potential non-acid producers (raw coal NNP=13.7 kg CaCO<sub>3</sub>/ton and slimes NNP=8.9 kg CaCO<sub>3</sub>/ton); whereas discard coal was found to have potential to produce acid (NNP= -12.2 kg CaCO<sub>3</sub>/ton).

Column leaching tests were also carried out on samples using both tap water and pit water to determine the chemistry of leachate from samples over a period of time. Raw coal and slimes produced neutral leachate (raw coal pH=6.11 to 7.16 and slimes leachate pH=7.12), whereas discard coal produced acidic leachate (pH=2.86). Discard leachate was found to be characterized by two stages; the initial rapid acid generation stage followed by cyclic buffering due to dissolution of calcite, and possibly by less reactive kaolinite, and mica. This study has identified potential risks of acid generation from the future discard coal dump and recommendations were made to ensure that appropriate measures to prevent pollution into the environment are developed and implemented.