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The effects of weathering on coal quality in the Limpopo and Soutpansberg Coalfields.

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The petrographic and geochemical properties of weathered coals and their fresh counterparts were investigated in the Limpopo Coalfield (Vele Colliery) and Soutpansberg Coalfield (Makhado Project). The extent of weathering was well constrained by the chemical index of alteration (CIA) and the chemical index of weathering (CIW) which showed that the majority of the coals from both localities were classified as moderately weathered. However, coals from Makhado were slightly more weathered than the coals from Vele Colliery (Figure 1). As a consequence of the short duration of exposure to secondary weathering (less than two years for Vele coals and approximately 5 years for Makhado coals), extreme weathering features such as well-developed oxidation rims, devolatilisation pores and plastic deformation were absent [1].

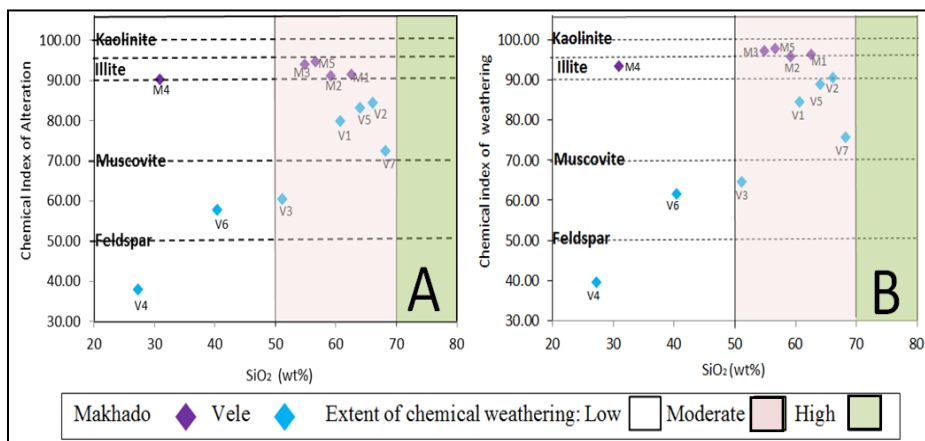


Figure 1: The extent of weathering for Makhado and Vele coals based on the CIA (A) and CIW (B).

Nonetheless, at low levels of weathering the free swelling index (FSI) was the most sensitive parameter to weathering (Table 1). As expected, weathered stockpile coals (M1, M3 & M4) from Makhado had reduced FSI values compared to their fresh counterparts (M2 & M4). However, the weathered coals (V2, V4, V5, and V6 & V7) from Vele were anomalous in that they had higher FSI values, whereas the FSI of the fresh stockpile coals (V1 & V3) was much lower. It would appear that the preservation of the fresh stockpile coal (V1) in an outdoor fridge played a role in retaining better qualities such as higher vitrinite content and calorific value, lower ash and mineral matter compared to the other fresh stockpile coal (V3) that had been stored outdoors [Table 1]. The findings of this study suggest that it is necessary when stockpiling coal for any duration to consider (a) better storage conditions to reduce the influences of

secondary weathering, and (b) constraining the rate at which the desirable properties of coal diminish when stockpiled. A follow up study is currently being extended into the Waterberg Coalfield with the intention of characterising coal weathering through an integrated use of geochemical, mineralogical and petrographic and techniques.

Table 1: Free Swelling Index for Makhado Project and Vele Colliery coals

Sample	
	M1
	M2
	M3
	M4
	M5
	V1
	V2
	V3
	V4
	V5
	V6
	V7
	FSI
	0
	7.5
	8
	1.5
	7.5
	1
	7
	0
	2.5
	4
	3.5
	3

References:

[1] Wagner N J (2007) International Journal of Coal Geology, 72 (3):177-186.

