



Physico-chemical characteristics and co-firing of *Searsia lancea* and *Tamarix usneoides* with high ash coal

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ABSTRACT

This study utilized two indigenous South African trees “*Searsia lancea* and *Tamarix usneoides*”, planted in woodland trials for phytostabilisation of heavy metal in soil and Acid mine drainage control at AngloGold Ashanti mining properties. The two species were harvested after twelve years from four different trial sites, and divided into different compartments such as root, wood, twigs and leaves. These sections were categorized for their physicochemical properties individually and in combined state based on their properties for combustion and co-combustion with coal.

The ash content of the *Tamarix usneoides* leaves was found to be in the range of 12.90 to 15.09%. This species is known to hyper-accumulate salts such as NaCl, sulphate and halogen, and excrete excess salts through an ion transporter. The *Searsia lancea* leaves possess the highest concentration of Sulphur, the composition of elements in the wood section was minimal than other sections. This species could be said to be an accumulator of metals rather than a soil stabilizer.

This research further involves the determination of the physico-chemical properties of the blends of the two tree species sections with and without leaves. The combustion and co-combustion reaction kinetics when burning the two-tree species with and without coal in various proportions were determined. In addition, the trace elements in the feed materials (coal, *Tamarix* and *Searsia*) and ash of the combusted/co-fired trees and their parts were evaluated. Investigation into the emission reduction when increasing biomass proportions during co-combustion with coal was also reported.

This study demonstrates that both indigenous tree species are capable of phytoremediation of contaminated mine sites, and still served as a suitable and compatible valuable source of biomass for combustion and co-combustion with South African high ash coal.

