

# **THE EFFECT OF THERMAL SHOCK ON THE ABRASIVE WEAR OF WC- 12wt%Co**

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for the degree of Master of Science in Engineering.

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## **DECLARATION**

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science in Engineering in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

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(Signature of candidate)

\_\_\_\_\_ day of \_\_\_\_\_ (year) \_\_\_\_\_

# ABSTRACT

This work is a preliminary attempt to study the effect between thermal shock and abrasive wear in WC-Co alloys. This was done by evaluating the thermal shock resistance of a WC-12wt%Co mining grade as a function of temperature, number of thermal shock cycles and making comparisons between the abrasive wear responses of samples subjected to thermal shock and samples not subjected to thermal shock.

A furnace was designed for the thermal shock treatments. Abrasive wear tests were performed on a 2-body sliding wear apparatus using 80-grit SiC abrasive paper as a counter-face. Stereo and electron microscopy as well as microprobe techniques were used to analyse the effects of thermal shock. It is confirmed that thermal shock has a negative effect on the wear rate of WC-12wt%Co. The results showed an initial high mass loss rate during abrasive wear testing, which increased with increasing temperature and a decrease in wear rate with time until the wear rates converged for all samples. The surface analysis after thermal shock indicated voids on and below the surface, stained surfaces, a thin oxide layer and the possibility of WC decarburization which accelerated the wear response.

*To*

*My son: Thabang Mochaki*

*My parents: Tlou Nelson Makgere and Maserole Josephine Makgere*

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