

## **ABSTRACT**

The aim of this research was to study the effect of adding Ru to WC-10Co-4Cr coating and determining the effect there of on corrosion properties, wear properties and tribo-corrosion properties of the coatings. The Ru powder was added to the 1350 VM/WC-731-1 powder in different concentrations ranging from 0.5wt% to 2wt%. The 1350 VM/WC-731-1 powder, which had a composition of WC-10wt%Co-4wt%Cr was mixed together with Ru powder for several hours before thermally coated on a steel substrate. The powders morphologies were characterized using Field Emission Scanning Electron Microscope (FESEM). The thermal coating method used was the High Velocity Oxygen Fuel (HVOF). After successful coating, the samples were sectioned to smaller pieces and different test were done on the smaller pieces to determine coating properties. FESEM characterization on coating morphologies were done before any test were performed and post-test FESEM characterization were also performed after each test.

On the results obtained, it was evident that the Ru addition had an effect of decreasing the hardness by very low margin. The microstructural analysis showed no to very little effect caused by Ru addition on the powder. The distribution of Ru on the coatings were not constant and it was distributed in small pockets or islands throughout the coatings. Two very corrosive environments, which were composed of synthetic mine water, at pH levels of 3 and 1, were used as corrosion electrolyte and tribo-corrosion electrolyte. The corrosion open circuit potential showed a positive results as the increase in Ru content had an effect of decreasing the corrosion potential. The wear rate of the coating decreased with increasing Ru content and the coefficient of friction also increased with increasing Ru content. Tribo-corrosion rates decreased with increase in Ru content in the coating.