



**EFFECT OF CARBON ADDITION AND VC ON
MECHANICAL PROPERTIES IN ULTRA-FINE
WC-Co CUTTING TOOL**

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“I declared that this thesis is the result of my own except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree.”

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ABSTRACT

Cemented tungsten carbide (WC-Co) is one of the most favourable material used in fabrication of cutting tools. High challenge in machining especially in machining hard material have accelerates the development of these engineered materials with enhanced properties. With addition of specific additives such as carbon (C) and vanadium carbide (VC) contributes to different improvement on the mechanical properties of the cutting tools. The addition of C in WC-Co composite will improve the hardness properties while the addition of VC will inhibit the grain growth. In this work, the effects of different composition of C and VC addition in ultra-fine WC-Co cutting tools on the mechanical properties such as the density, hardness and transverse rupture strength (TRS) are investigated. WC-Co powders mixed with 0.2%VC and 0.2%C. The mixed powders are compacted and sintered as per conventional powder metallurgy (PM) route. Mechanical properties of sintered cutting tools are measured such as the hardness of the cutting tool using Vickers Hardness Test and transverse rupture strength (TRS) using the Universal Testing Machine. The microstructure of the sintered samples are observed using Scanning Electron Microscope. The results show that the highest hardness and TRS are 2041MPa and 2725HV respectively which is obtained at the composition of WC-Co-0.2%C-0.2%VC.