



**INFLUENCE OF CARBON ADDITION ON
MECHANICAL PROPERTIES IN ULTRA-FINE
WC-Co CUTTING INSERT**

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JANUARY 2017**

“I declare that the content present in this thesis are my own work which was done at Universiti Teknologi MARA (UiTM) unless stated otherwise. The thesis has not been previously submitted for any other degree.”

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ACKNOWLEDGEMENT

Bismillahirrahmanirrahim,

In the name of Allah, the Beneficent, the Merciful.

First and foremost, praised to Allah S.W.T for His blessing for giving me good health as well as strength and guidance which has enabled me to accomplish this thesis successfully. I would like to express my huge appreciation goes to my Final Year Project supervisor, Ir Dr. Salina Binti Budin for the continuous support, advice and guidance thus I had completed my thesis during the period given. On many occasions, her knowledge and insight were invaluable.

Further, I would like to express my sincere gratitude to Advanced Materials Research Centre (AMREC), SIRIM Berhad for giving me the opportunity to use the facilities to conduct this project. Special thanks to AMREC staffs Dr. Mohd. Asri Bin Selamat, Mr. Mohd Hasnan Bin Abdul Hamid, Mr. Zaim Syazwan Bin Sulaiman, Mr. Ahmad Aswad Bin Mahaidin because of their kind cooperation, guidance, and support until this project have been done successfully. Big thanks to all project members Nurul Nazihah Binti Ismail, Muhammad Haikal Bin Mukhtar and Aidil Rizam Bin Azmi for their friendliness and patiently helping me with the best cooperation.

Last but not least, I would like to convey my deepest appreciation to my family especially to my father Muin Bin Ismail and my mother Faridah Binti Abdullah for giving me strength and always be my side within the project period.

ABSTRACT

Tungsten carbide–cobalt (WC–Co) are used as cutting tools because of a combination of desirable high hardness and high fracture toughness due to the respective contributions of the carbide and metallic phases. The mechanical properties of these materials depend on their composition and microstructure especially on the grain size of the carbide phase. The addition of specific metallic would lead to further improvement of its mechanical properties. In this work, the influence of Carbon (C) addition in WC-Co composite on mechanical properties in ultrafine WC-Co composite was studied. The percentages of carbon are varied at 0%, 0.1%, 0.2%, 0.3%, and 0.4% The samples were prepared using powder metallurgy routes with involving mixing, drying and sieving, compaction, cold isostatic pressing (CIP) and sintering. Mechanical properties such as hardness, transverse rupture strength (TRS), density and microstructure were measured. The hardness is measured using Vickers Hardness tester while the TRS is determined using Universal Testing Machine. In addition, the density is measured using Electronic Densimeter and the microstructure is observed using Scanning Electron Microscope. It exhibits that the hardness of WC-Co composite is decreased with the increasing of carbon percentages. The maximum hardness is gain at the composition of 0.1%C. A similar trend was observed for TRS and density.