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Development of a WC-based cemented carbide using stainless steel as binder and titanium carbide

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Cemented carbides belong to the most common and most important cutting tool materials, representing about half of the global market. To date, cemented carbides of the WC-Co system are preferred because they have an excellent combination of hardness, wear resistance and fracture toughness. However, substitutes for cobalt have been researched due to its toxicity, shortage and high cost. Promising results have shown that it is possible to achieve properties like the cemented carbides of the WC-Co system using stainless steels. In view of this, in this work a cemented carbides will be produced using WC, stainless steel, TiC and C. The addition of TiC is intended to inhibit the growth of grains at high temperatures, while C will be added to suppress the lack of carbon it takes to the formation of phases η. Samples will be manufactured using the spark plasma pulsed sintering process at different temperatures. From Archimedes' principle, the density of the samples and the densification promoted by each sintering temperature will be determined. Vickers microhardness and hardness tests will be carried out. Through indentation of the Vickers hardness test, the lengths of the cracks formed will be measured to determine the fracture toughness. It is expected, from this combination of components of the system, to produce a cemented carbides with high hardness, toughness and densification. The results of this work will be compared with data found in the literature to verify the feasibility of its use.

Keyword: cutting tool; densification; microstructure; hardness; fracture toughness.

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