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Spark plasma sintering of cemented carbide WC-10% wt. AISI 304L cemented carbides using nanopowders

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Tungsten carbide (WC) cemented carbides with alternative binders to cobalt have been researched due to the low availability, high cost and toxicity of this element. Promising results have been found for the use of austenitic stainless steel microparticles of AISI 304L as binders in cemented carbides, since they have good wettability with WC and produce materials with mechanical properties and corrosion resistance comparable to cemented from the WC-Co system. In this context, this work aims to produce cemented carbides using a combination of WC nanoparticles and 10% AISI 304L stainless steel. The production of these composites will be carried out via sintering by spark plasma sintering at different temperatures. Density, densification, microstructure, hardness and fracture toughness of the samples will be analysed. It is expected to show the benefits of using nanoparticles to produce carbide, in addition to the effects of temperature in the sintering process. Finally, a comparison will be made with data found in the literature on cemented carbides from the WC-Co system that will indicate the possibility of replacing AISI 304L as a binder of these materials.

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

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