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Evaluation of Mechanical Properties and Microstructural Behavior of Sintered WC-7.5wt%Co and WC-12wt%Co Cemented Carbides

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WC-Co and other similar cemented carbides have been widely used as hard materials in industrial cutting tools and as mould metals; and a number of techniques have been applied to improve its microstructural characteristics, hardness and wear resistance. Cobalt is used primarily to facilitate liquid phase sintering and acts as a matrix, i.e. a cementing phase between WC grains. A uniform distribution of metal phase in a ceramic is beneficial for improved mechanical properties of the composite. WC-Co, starting from initial powders, is vastly used for a variety of machining, cutting, drilling, and other applications because of its unique combination of high strength, high hardness, high toughness, and moderate modulus of elasticity, especially with fine grained WC and finely distributed cobalt. In this study, that started with two different compositions of initial powders, WC-7.5wt%Co and WC-12wt%Co with initial powder size being 1～3 μm, magnetic pulsed compaction followed by subsequent vacuum sintering were carried out to produce consolidated preforms. Magnetic Pulsed Compaction (MPC), a very short duration (～600 μs), high pressure (～4 Gpa), high-density preform molding method was used with varied pressure between 0.5 and 3.0 Gpa, in order to reach an initial high density that would help improve the sintering behavior. For both compositions and varied MPC pressure, before and after sintering, changes in microstructural behavior and mechanical properties were analyzed. With proper combination of MPC pressure and sintering, samples were obtained with better mechanical properties, densification and microstructural behavior, and considerably improved than other conventional processes.

Keywords: Mechanical Properties, Magnetic Pulsed Compaction, Sintering, Cemented Carbide

E-8

Study on the Properties of Interfacial Reactions for the Gold Thickness of ENIG Surface

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