



## The Basic Knowledge of Cemented Carbide Cutting Tool Material

Cemented carbides are the most widely used class of materials for high-speed machining (HSM). They are the products of powder metallurgy and consist of hard principal ingredient (usually tungsten carbide WC) and a binding metal. Currently, there are hundreds of different WC-based cemented carbides. The majority of them utilize cobalt (Co) as the binder, but nickel (Ni) and chromium (Cr) are also commonly used. Other alloying elements may be added as well. Why are there so many grades and how does a toolmaker select the right material for a given application? To answer these questions, let's firstly review what makes cemented carbides desirable as cutting tool materials.

### Hardness and toughness

WC-Co has a unique combination of hardness and toughness. WC by itself is very hard, surpassing corundum, or aluminum oxide, in hardness and loses little hardness at elevated working temperatures. However, it lacks sufficient toughness to function as a cutting tool.

advantage in terms of both hardness and toughness. Tungsten carbide (WC) itself has a high hardness (above corundum or alumina), but also when the operating temperature increases the hardness are rarely dropped. However, it lacks sufficient toughness, which is essential for the performance of the cutting tool. To take advantage of the high hardness of tungsten carbide and improve the toughness, it is the use of a metal binding agent, the combination of tungsten carbide, so that it not only has a hardness far exceeding high-speed steel, but also able to withstand the processing of the majority of the cutting the cutting force. In addition, it can also withstand high temperatures speed machining cutting produced.

Today, almost all of the WC-Co cutting tool inserts are used and the coating, so that the role of the matrix material seems less important. But in fact, (a measure of the stiffness of the triple, WC-Co is about room temperature elastic modulus of high speed steel) is a high elastic modulus material is WC-Co coating provides a non-deformable substrate. WC-Co substrate can provide the desired resilience. These properties are the basic characteristics of the WC-Co material, but may be in the production of cemented carbide powder by adjusting the material composition and material properties tailored microstructure. Therefore, the tool performance and suitability of a particular process depends largely on the initial milling process.