

WHAT MAKES A CVD DIAMOND COATED CUTTING TOOL “BEST OF BREED”?

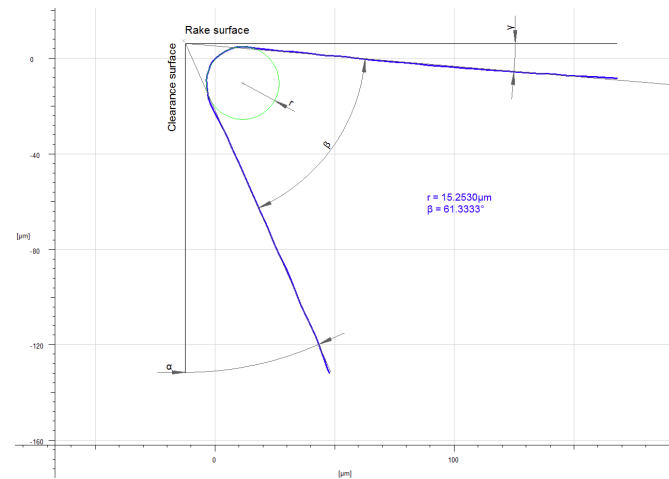
The need for CVD diamond coated cutting tools continues to grow. Driving this growth is the use of composites within the Aerospace, Automotive, and other industries. In order to have a Best of Breed cutting tool used to machine carbon fiber reinforced plastic (CFRP) or other composites, there must be a clear understanding of each application. The machining function, the material, and the goals of the operations all must be considered on a case by case basis in order to provide a top performing CVD coated cutting tool. Since the cost of machining errors and scrapping material is very expensive, a top performing tool is defined as not only a tool that last the longest, but a tool that performs with consistency. End users do not plan for the best case, but the worst, so a consistent wear rate in addition to extended wear is critical to providing a Best of Breed CVD diamond coated cutting tool.

The coating of cutting tools with CVD diamond is a very complex process with many variables that must be optimized and tightly controlled in order to consistently deliver extended wear rates. At SP3 we have spent over 100 man-years of R&D optimizing coating variables and developing tight process controls. Some of the key items that must be considered are:

Carbide

The carbide that is chosen is very important. SP3 is capable of coating a variety of carbides, both micro-grain and fine-grain, 6% cobalt carbides and in some cases 10% cobalt carbides. Depending on the application and tool geometry certain carbides will perform better than others. SP3 has optimized its processes for specific carbides as each carbide reacts to the coating process differently.

DOWNLOAD our approved carbide list or **CONTACT US**
(<https://www.sp3diamondtech.com/contact/>)



Tool Geometry

Tool design plays a critical role in tool performance. We rely on the cutting tool manufacturer's expertise to provide the best design, and the best manufacturing process for CVD coating. We do work closely with our customers to test and optimize tool design. We have state of the art analytical tools in house to measure tool parameters, as well as the ability to machine test tools in-house.

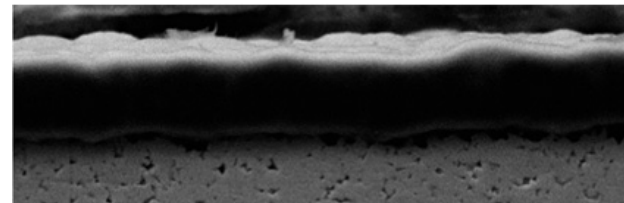
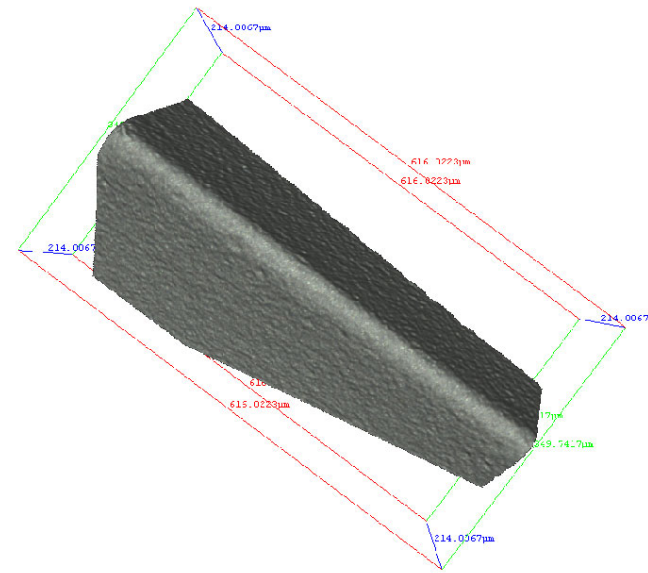
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Cutting Edge Preparation

The quality of the tool grind is paramount to ensuring the strength of the tool's cutting edge. But even with the best grind there can be edge defects and surface defects that can cause low mechanical strength resulting in premature edge chipping. This in turn can significantly reduce the useful life of a cutting tool. How the cutting edge is prepared can also influence the quality of the diamond coating. As a result, SP3 has advanced tools in-house to

perform analytics of the cutting edge together with its customers. In addition, if the application requires, SP3 has the capabilities to perform edge preparation as an additional part of the manufacturing process.

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Substrate Preparation

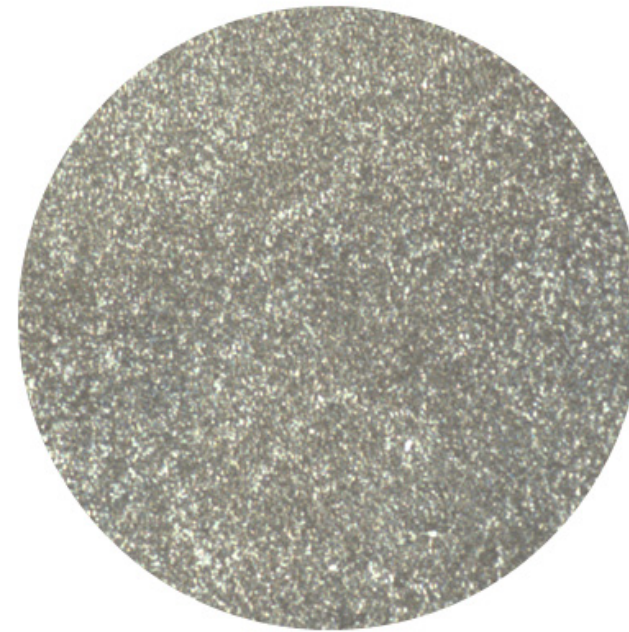
In order to attain perfect adhesion, which means that the diamond coating simply wears through rather than flaking, chipping, or having the carbide break underneath the coating, the process parameters used for preparing the carbide are critical. There are two primary factors that must be tightly controlled in order to provide perfect adhesion. First is surface roughness, as the diamond bond to the tool substrate is a mechanical bond. The second factor is chemical compatibility. Cobalt, which is used as the binder for tungsten carbide, is a deterrent to diamond growth. Cobalt must be removed from the surface of the tool in a way that does not over weaken the carbide. SP3 has very sophisticated processes and controls within its manufacturing operations that optimizes and tightly manages the substrate preparation process.

CONTACT US (<https://www.sp3diamondtech.com/contact/>) to learn more about substrate preparation.

Diamond Coating

Different applications require different coating thicknesses and characteristics. At SP3 we have developed a wide variety of 'recipes' that allows for coating thicknesses from 3um up to 50um. In addition we can produce extremely smooth coatings or rougher coatings, low stress coatings, compressive coatings or tensile coatings, all tuned to the customer's application.

DOWNLOAD OUR CHART OF COATINGS or **CONTACT US**
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