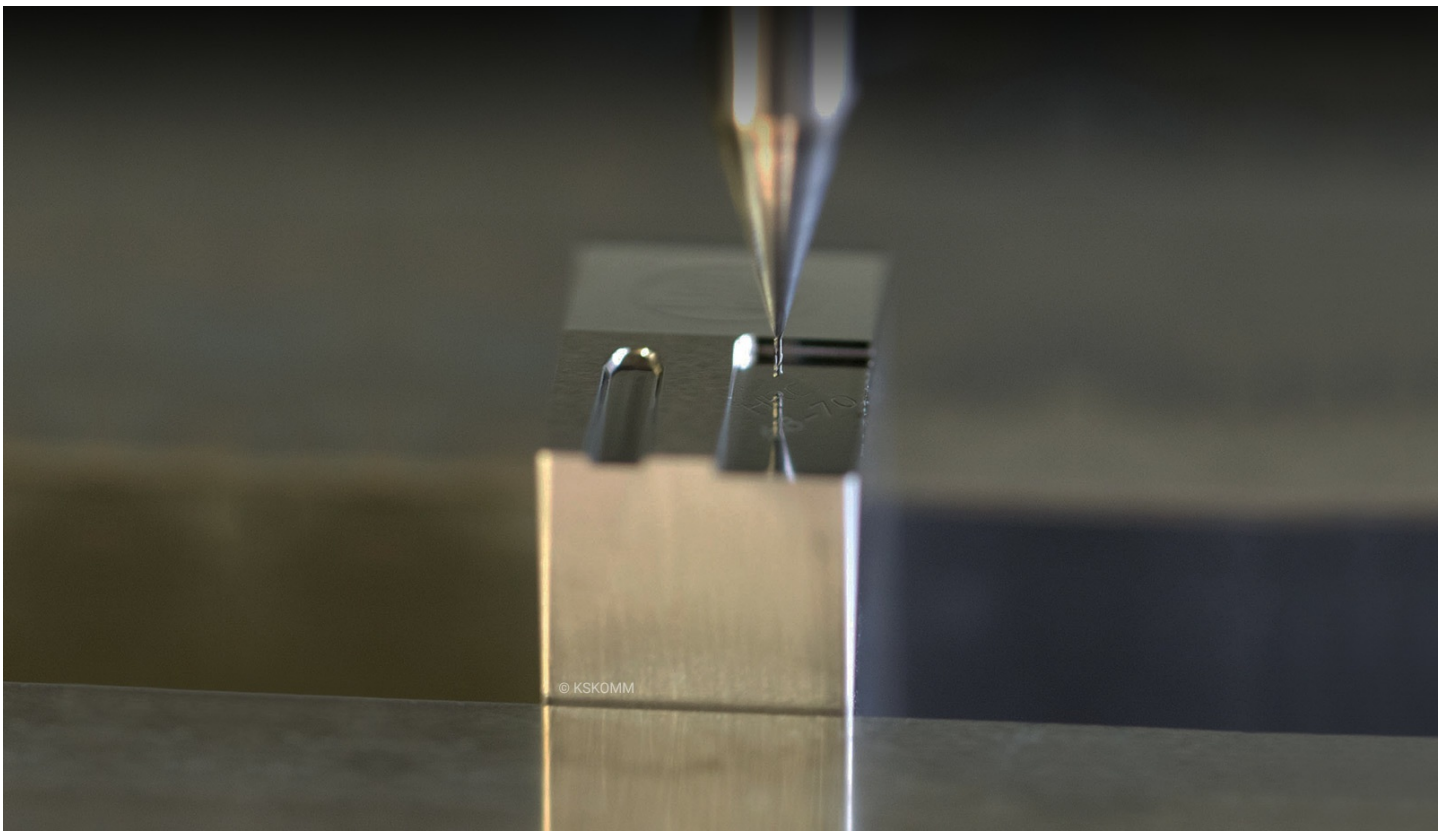
Ultra thin and extremely smooth



HiPIMS coatings for small and the smallest tools

In the fields of electronics and medical technologies, the high-precision machining of the smallest components, with tools that are only a few millimeters or even tenths of a millimeter thick, is the key to innovation – now more than ever. Ultra-thin and extremely smooth HiPIMS coatings from CemeCon AG provide the decisive advantages here – especially in hard materials that are difficult to machine.

High-precision tools are required to machine a workpiece reliably and economically in working ranges from 2 mm to 0.1 mm. In addition to special geometries, efficient coating solutions provide the decisive advantage. A condition is the precise coordination of geometry, material and coating. With CemeCon, tool manufacturers have the perfect partner at their side.

“With our premium engineering service, the focus is on the tool in its customer-specific form and function. Especially with new geometries, innovative tool concepts and special applications – such as tools for micro cutting – the path is increasingly leading to this fully engineered premium coating. In close cooperation with the tool manufacturer, we project a coating solution that is precisely tailored to the tool and application requirements,” says Marc Semder, Sales Manager at CemeCon.

Smoother than any other

When every µm determines the success or failure of a microtool, tool manufacturers must be able to rely on

the performance of the coatings. Uncompromising smoothness is a must. The HiPIMS process will be the key to success here. Because coating errors such as droplets cannot occur at all with this unique technology. The result are extremely smooth coatings that also meet the low tolerances of miniature production.

Such perfectly smooth surfaces on cutting tools reduce both friction and built-up edges, while at the same time shortening the contact time between chip and tool. The heat input is thus lower and much of it is dissipated with the chip. Oxidation wear is also significantly lower. The result is a long service life – even with dry and HSC machining.

The list of positive characteristics is long

“HiPIMS coatings combine an extraordinary number of positive properties – perfect for micro cutting: They are not only extremely smooth, but also incomparably adhesive, hard and tough at the same time. In addition, they have a fine-grained, very dense morphology, a lower residual stress and high thermal stability. This is how they effectively counteract abrasive wear. No other coating process can achieve this combination,” says Marc Semder enthusiastically.

Ultra-thin coatings around 1 µm have (almost) no influence on the filigree geometry of the micro tools. HiPIMS allows **very thin and thick layers down to 12 µm**. Thanks to the process, the cutting edges are also not unintentionally rounded. Thereby HiPIMS enables a homogeneous layer growth on complex tool geometries around the cutting edge. This ensures an even coating thickness distribution within very narrow tolerances, which are required for micro cutting.

InoxaCon® for demanding tasks

Especially in miniature production, wear resistance and temperature resistance of the tools are decisive factors for the economic efficiency of production. This is especially true when very hard materials have to be machined, such as those used in medical and dental technology.

“The composition of the coating material has a great influence on the cutting process. InoxaCon® – one of our HiPIMS coating materials – offers tool manufacturers decisive advantages, for example in the machining of chrome-cobalt alloys for implants,” says Manfred Weigand. The smooth surface of InoxaCon® reduces friction during machining. The very good coating properties allow the use under the toughest conditions with low coating thicknesses of, for example, 1.5 µm. Therefore, the cutting edges remain so sharp that feed and cutting speed can be selected for minimum cutting forces and thus better machining results. InoxaCon® prevents work hardening and ensures process stability - also because the HiPIMS coating material optimally protects the tool from heat in the cutting process thanks to its high temperature stability.

Adapted tools with a coating based on an InoxaCon® coating specification produce excellent surfaces during milling. This eliminates polishing work, for example. This shortens process times and ensures more efficient automated production.

Medical technology

Micro tools

Micro-geometry

Chrome-cobalt alloys

Thermal stability

Bonding

Low abrasion wear

Low friction

Dense morphology

Dental technology

hardness

micromachining

electronics

difficult-to-machine materials

built-up edges

contact time

oxidation wear

Toughness

abrasive wear

edge rounding

even layer thickness distribution

work hardening