Cerac P PVD Coating

Unique Quality

●Dies and machine parts ●Cutting tools

Physical vapor deposition (PVD) is a coating method that employs vacuum deposition, sputtering, and ion surface treatment technologies in an ion plating method to apply an ultra-hard ceramic surface coating on treated objects. The coating is formed at low temperature (500°C or lower), so there is no change in the product dimensions and a coating with outstanding wear and galling resistance is formed.
Cerac P is an ion plating method that uses a high-ionization vertical electron beam to form ultra-hard TiN, TiCN, CrN, and TiAlN coatings with better adhesion properties than other PVD techniques.

Features of Cerac P

1 No change in properties or dimensions

Since treatment is performed at 400°C to 500°C, there are no changes to the base material properties, dimensions and shape, making the process ideal for high-precision dies and cutting tools.

2 Homogeneity and Uniformity

Proper control of magnetic fields and a unique rotating and revolving function create a homogeneous coating of uniform quality and consistent thickness.

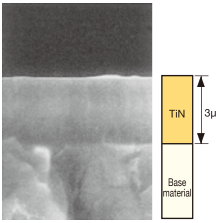
3 High Adhesion

Plasma control using a vertical beam and magnetic coils prevents recombination of ions and electrons, raising the ionization rate and providing greater adhesion than other PVD techniques.

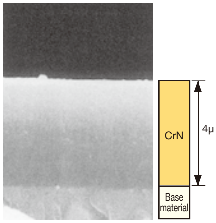
4 High Corrosion Resistance

Both TiN and CrN coatings exhibit good corrosion resistance, but CrN in particular has much better resistance than Cr plating, making it ideal for corrosion and wear resistant dies and tools.

●TiN Coating Cross Section Structure



●CrN Coating Cross Section Structure



●Coating Properties ●Applications

Coating Properties	Applications
TiN	Wear resistance, mold release, seizing resistance
TiCN	High wear resistance, low coefficient of friction
CrN	Corrosion resistance, heat resistance, mold release
TiAlN	High hardness, heat resistance (high temperature oxidation resistance)

●Examples of Cerac P Uses

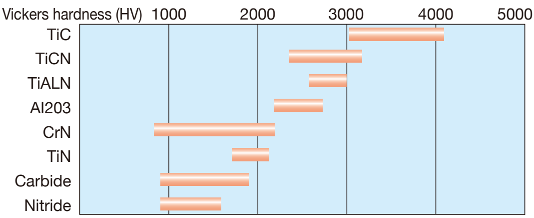
High-speed hardened cutting tools	■Drills ■End mills ■Milling cutters, etc.	Cutting blades	■Slitters ■Knives, etc.
Dies	■Punch dies ■Cold forging punch dies ■Ejector pins, core pins ■Die cast dies, etc.	Machinery parts	■Screws ■Shafts ■Accessories, etc.
		Ornamentation	■Watch cases, etc.

Examples of the Effects of Cerac P

Component	Machining details (conditions)	Machined material	Die or tool material	Comparison of effects: Treatment	Results	Cerac P	Results (pcs or units)
Drill (ø6)	Rotation speed: 1,300 rpm	S55C	SKH51	Untreated	40 units	TiN	380 units
Molding punch	Exterior diameter: ø65, interior diameter: ø55	SUS304(t1.5)	SKD11	Untreated	50,000	TiN	1,400,000
Cutter	200 × t3.0	Paper	SKH51	Untreated	5 days	TiN	30 days
Bore	Blanking punch	SUS302(t1.9)	SKH51	TiN	26,000	TiCN	40,000

TiN (gold) TiCN (silver)

Cerac P: Comparison of Hardness and Physical Properties



●Physical Properties of Ti-Alloy Coatings

Physical property \ Type	Carbide TiC	Carbonitride TiCN	Nitride TiN
Color	Clear gray	Bright red	Gold
Hardness (HV)	3000–4000	2600–3200	1900–2400
Melting point (°C)	3160	3050	2950
Density (g/cm3)	4.92	5.18	5.43
Coefficient of thermal expansion (200°C– 400°C)/°C	7.8×10^{-6}	8.1×10^{-6}	8.3×10^{-6}
Electrical resistant (Ω at 20°C)	85	50	22
Coefficient of elasticity (N/mm2)	43.93×10^{4}	34.53×10^{4}	25.10×10^{4}
Proper coating thickness (μm)	4–8	6–10	4–8
Trend of major properties: Hardness	High	———	Low
Trend of major properties: Chemical stability	Low	———	High