电弧(一般) Arc(Traditional)

优点 Advantages：

超硬涂层
Super-hard coating

高刚性
High-rigid

最佳附着力
Optimum adhesive force

紧密涂层
High density coating

适合3D
Suitable for 3D

高沉积率
High-deposition rate

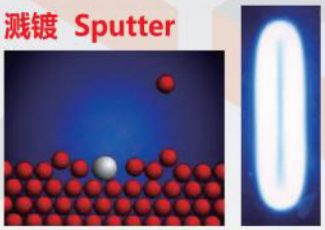
经济
Economical

缺点 Disadvantages：

粗糙 Rough

液滴 Droplet

溅镀 Sputter



优点 Advantages：

平滑涂层
Smooth coating

颜色变化性大
Large color variation

针对2D
Aiming at 2D

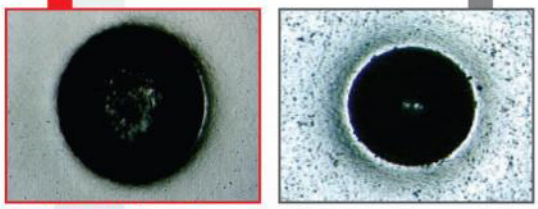
缺点 Disadvantages：

低沉积率
Low deposition rate

附着一般
Adhesion is general

低硬度（柱状）
Low hardness(columnar)

附着力测试 Adhesion test



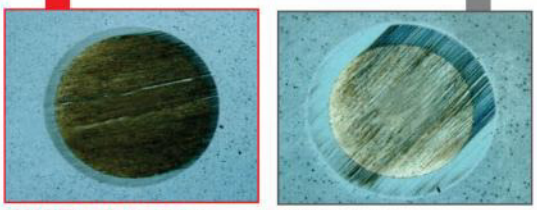
劈裂电弧 Splitting arc

涂层结合力好
Excellent adhesion

一般电弧 Traditional arc

附着力HF2
Adhesion HF2

电弧 & 溅镀 Arc & Sputter



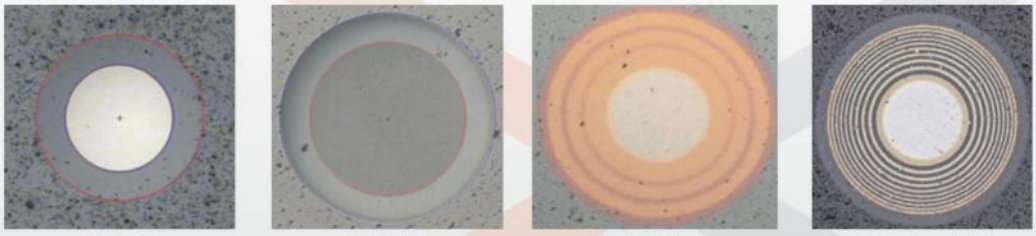
劈裂电弧 Splitting arc：

靶材 Target：AlTi =60/40 at.%
厚度 Thickness= 1.5μm
硬度 Hardness=3,300HV

溅镀 Sputter：

靶材 Target：AlTi =60/40 at.%
厚度 Thickness= 1.5μm
硬度 Hardness=2,000HV

涂层结构 Coating structure



单层涂层
Single-layer coating

渐变涂层
Gradient coating

复合多层涂层
Multi-layer composite coating

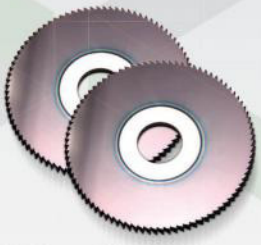
复合纳米多层涂层
Multi-layer nano composite coating

涂层解决方案
Coating solutions

涂层种类 Coating Type	颜色 Color	纳米硬度 (HV) Micro-hardness	纳米厚度 (μm) Thickness	摩擦系数 CIF	最高应用温度 (℃) Highest temperature
TiN	金黄 Golden yellow	2400	1~7	0.35	600
TiCN	蓝灰 Bluish-grey	3700	1~4	0.2	400
TiCN-MP	红铜 Red-copper	3200	1~4	0.2	400
TiAlN	紫红 Purplish-red	3300	1~4	0.4	800
CrN	银 Silver	1800	1~7	0.3	700
F5	黑 Black	3800	1~10	0.4	900
TiCrN	银/金 Silver/Gold	3000	1~7	0.4	600
HPS	黑 Black	3800	1~4	0.35~0.4	900
DLC	灰黑 Grey-black	2000	1~3	0.1	400
MDT	玫瑰紫 Rose-purple	4000	1~4	0.25	800
ALL	古铜 Copper	4300	1~3	0.3	1200
TMAC	蓝灰 Bluish-grey	3300	0.4~4	0.3	1100
NF1	白金 White-gold	2000	1~4	0.25	550
nA-Bu	蓝紫 Blue- purple	4500	1~4	0.4	1200
WC/C	黑色 Black	3000	1~4	0.1~0.2	400

涂层类型 Coating Type	涂层特性 Properties	应用 Applications
TiN	涂层附着力好、表面光洁度高 Excellent adhesion and fine surface finish	用于成形、塑胶注塑、五金冲压、机械零件抗磨涂层；该涂层不改变原来表面光洁度，可适用于镜面表面涂层 Applied to forming, plastic injection molding, metal stamping, wear-resistant coatings for machine components. No affection on original surface finish and suitable for mirror coating.
TiCN	耐磨，摩擦系数低 Wear-resistant, low-friction coefficient	适用于铣削，冲压成型，丝攻，注塑成型，断续切削 Applied to milling, press forming, tapping, injection molding and interrupted cutting
TiCN-MP	涂层附着力好、韧性高，耐磨擦 Excellent adhesion, excellent toughness, wear-resistant	适用于断续切削、铣削、丝锥、成形、冲压等加工方式的应用 Applied to interrupted cutting, milling, tapping, forming, stamping
TiAlN	耐高温、耐磨损、兼具硬度与韧性的通用性涂层，附着力强 High temperature resistance, wear-resistant, excellent toughness and hardness, excellent adhesion	适用于钻孔，车削，高速铣削，及添加了玻纤及加硬塑料的注塑成型模具 Applied to drilling, turning, high-speed cutting, injection mold with glass fiber and hard plastic added
CrN	表面光洁度好、自润滑能力强，兼具耐磨、耐腐蚀、抗氧化性能，与底材之间附着力强 Excellent surface finish, strong self-lubricating, wear-resistant, corrosion-resistant, oxidation-resistant, excellent adhesion	适用于加工铜刀具，注塑成型，易腐蚀性塑料，机械轴、套、销等零件，可做低温涂层 Applied to copper tool, injection molding, corrosive plastic, components like mechanical axis, pin. Can be performed with low temperature coating.
F5	具有高硬度、耐氧化、温度高以及热稳定性、低切削阻力 High hardness, oxidation-resistant, thermally stability, low cutting-resistance	适用于难加工材料、52HRC以下钢材高速铣削、螺纹车削、不锈钢加工 Applied to abrasive materials, high-speed cutting for steels above 52HRC, thread turning, stainless steel cutting
TiCrN	易脱模、减少注塑粘附，兼具耐磨、抗腐蚀性能 Easy-demold, low-adhering, high wear-resistance, corrosion-resistant	适用于注塑模、冲压模、零件及添加了玻纤及加硬塑料的注塑成型模具 Applied to injection mold, punching die, components and injection mold with glass fiber and hard plastic added
HPS	高耐磨性能，热安定性佳，低摩擦力 High wear-resistant, thermal stability, low friction	加工齿轮切削刀具专用涂层，适合中高速齿轮加工 Specialized coating for gear cutting, especially applicable for medium and high speed gear cutting
DLC	摩擦系数低、附着力好、润滑性好 Low-friction coefficient, excellent adhesion, high lubrication	适用于模具、零部件、医疗器械等表面涂层，特别适用于滑动件及非铁金属的切削 Applied to coating of mold, parts and medical devices, especially applicable for slide and nonferrous metal
MDT	涂层韧性好、涂层显微硬度高 Excellent toughness, high micro-hardness	是车、钻、铣、冲等加工方式的理想涂层 Ideal coating for turning, drilling, milling and punching which is applicable for dry and wet high-speed cutting
ALL	耐热温度高、抗氧化性能好、抗磨损能力强 High temperature resistant, oxidation-resistant, strong abrasive resistant	可加工55HRC以上的的高硬难加工材料，非常适用于高速、干式切削加工，在钨钢高速钻头领域应用显著 Applied to abrasive materials above 55HRC, especially applicable for high-speed cutting and dry-cutting which is dominant in tungsten carbide high-speed drill
TMAC	耐高温，抗氧化，高韧性，耐磨 Excellent heat temperature, oxidation resistance, high tenacity, wear-resistant	适用于滚齿刀、冲棒、冲压模具、钻头、刀粒以及高光不锈钢的加工，广泛应用于切削、冲压、铝压铸等应用领域 Applied to gear hobs, punches, punching die, drill, insert and mirror surface stainless steel which is widely used in cutting, punching and Al die-casting
NF1	不含Ti和Cr的涂层 Coating without Ti nor Cr	适用于软胶、硅胶等注塑模具防粘利脱模，以及铝、铜、钛材料的五金模具及零件 Applied to plastic injection mold and silicon mold on anti-plastic sticking and also on aluminum, copper and Titanium molding and its components.
nA-Bu	极高抗热性能；高硬 High thermal performance; High hardness	适合硬切削；适合高要求及一般切削条件加工；外表可涂成装饰性蓝色 Suitable for hard cutting; Suitable for high requirements and general cutting conditions; Appearance can be painted decorative blue
WC/C	低摩擦系数；润滑性好；抗撞击、抗疲劳性极优 Low friction coefficient; High Lubricationl; Excellent impact resistance, fatigue resistance performance	适用于模具零件，如齿轮、轴类、机械设备的滑动滚件领域 Applicable to mold parts, such as gear, shaft, mechanical equipment of the sliding field of rolled piece

刀具
Cutting Tools



微小刀具放大图
Zoom in of mini tools

丝锥、钻头、非标、标刀、滚刀
Taping 、Drilling 、Special milling, Milling cutters, Hobs

提高：
Improve:

- 強度 intensity
- 韧性 toughness
- 硬度 hardness
- 耐磨性 abrasion resistance

经济效益：
Economic effectiveness:

- 降低刀具设备成本
  Reduce the cost of tool machine
- 减少刀具品种库存量
  Reduce the varieties of the cutting tool inventory
- 减化刀具管理
  Simplify tool management
- 有涂层刀具替代没有涂层刀具
  Coated tools can replace un- coated cutters

科汇涂层后的刀具：
Tools after coating :

- 切削刀具抗各种磨损的能力提高、刀具寿命延长
  Improve abrasive resistant and prolong life of cutting tools
- 被加工零件的表面精度提高
  Improve surface precision of workpiece
- 切削速度和进给速度提高，最终提高了切削效率
  Increase cutting and feeding speed which contributions to cutting efficiency

应用案例 Cases of application

不锈钢用铣刀 Milling tools for SS F5

Information 资料

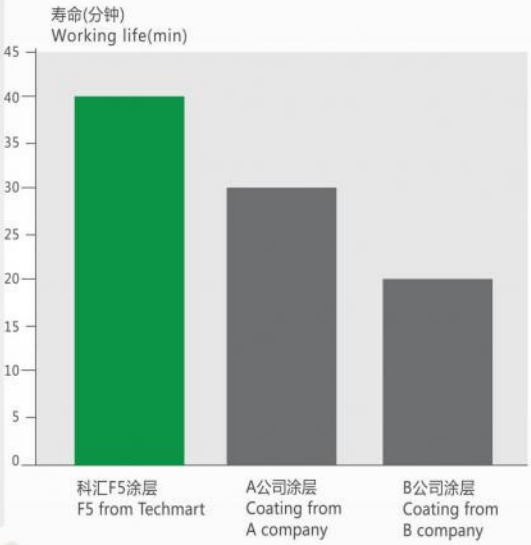
测试条件:
Conditions
刀具名称: 4 刃平头端铣刀
Tool name: 4-edges flat-end milling cutter
刀具规格: D1.5R0.1-2L-D4-50L-4F
Specification: D1.5R0.1-2L-D4-50L-4F
加工材料: 316L
Cutting material: 316L

Processing requirement 加工条件

转速: 10,000 RPM
Spindle speed: 10,000 RPM
切削速度: 47m/min
Cutting speed: 47 m/min
进给速度: 1,200mm/min
Feed rate: 1,200mm/min

Processing requirement 加工条件

每齿进给量: 0.12mm/tooth
Feed rate per tooth: 0.12mm/tooth
切深: 0.15mm
Cutting-depth: 0.15mm
切宽: 1.5mm
Cutting-width: 1.5mm
铣削方式: 路随周边-顺铣
Cutting type: Climb milling
冷却方式: 油冷
Cooling type: Oil cooling



涂层公司 Coating solution	科汇F5涂层 F5 from Techmart	A公司涂层 Coating from A company	B公司涂层 Coating from B company
测试结果 Test result	40分钟磨损量轻微 Slight wear after 40min	30分钟磨损量一般 General wear after 30min	20分钟磨损量严重 Serious wear after 20min

测试性能比较：科汇PNA涂层>A公司涂层>B公司涂层

Performance comparison: F5 coating>Coating from A company>Coating from B comany

科汇F5涂层 F5 from Techmart	A公司 Coating from A company	B公司 Coating from B company