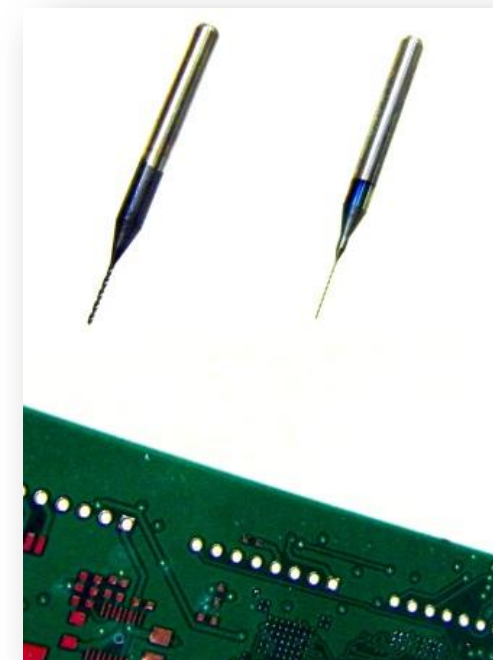




New generation of ta-C coating machines for high end PCB microdrills

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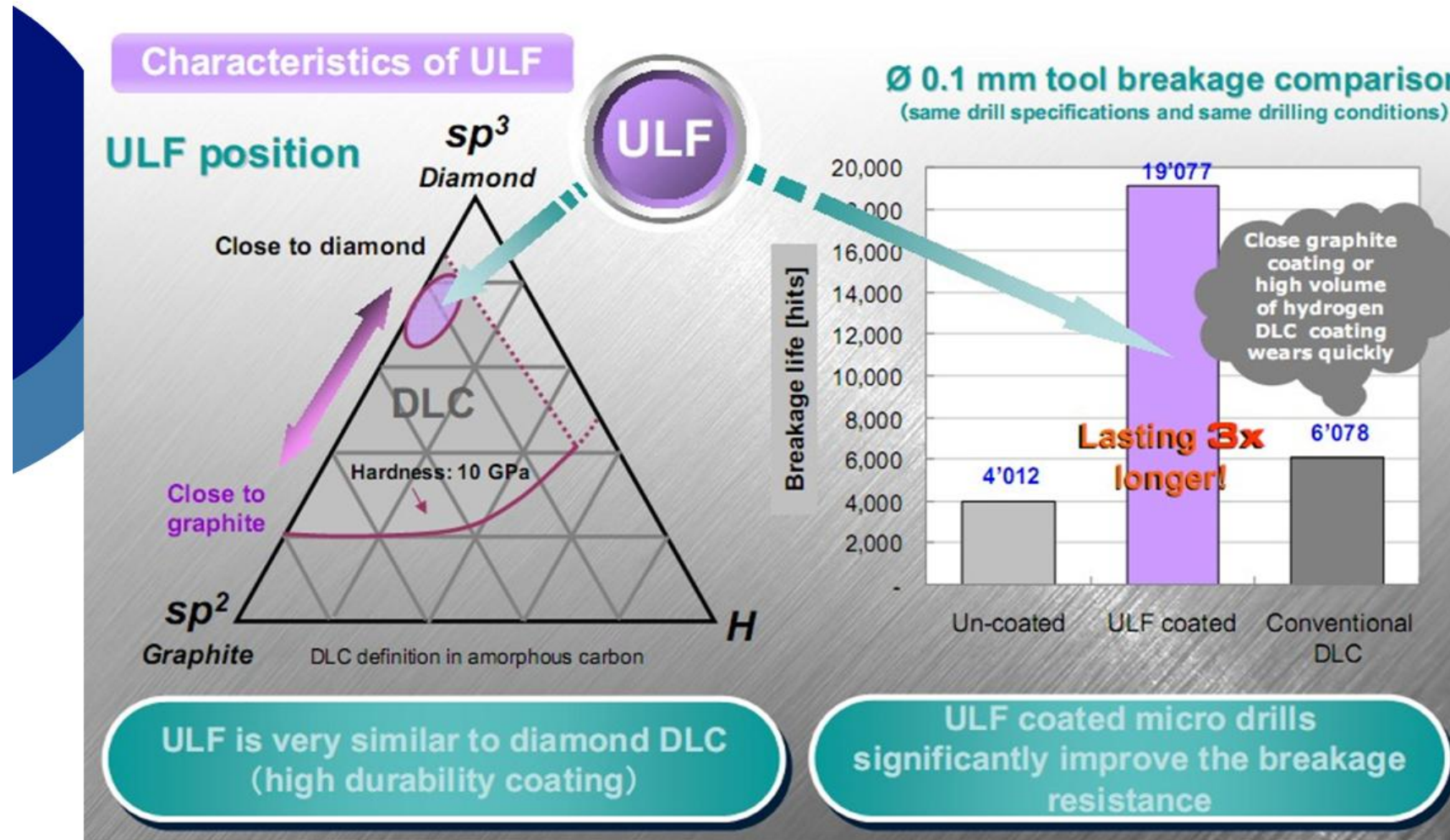
The Company Union Tools in Japan, market leader in PCB micro driller manufacturing, has successfully applied a coating technology developed by SWISS NANOCOAT / Creepservice, Switzerland.

The technology called ULF (ultra low friction) has been used for a long time under a temporary license agreement between Union Tools and SWISS NANOCOAT SA

The ta-C coating (tetrahedral amorphous carbon, without hydrogen) is ideal for PCB microtools.

SWISS NANOCOAT will now presenting a new generation of ta-C coating machines for microdrill applications.

Overview about ta-C (ULF) DLC coating



High throughput production Coating machine SNC500



- Deposition rate: 0.6 micron/hour over 600mm height on 2.5 rotation carousel
- Film uniformity: +/-10% over 600 mm height
- Batch capacity: 12'000pcs of 3.175 mm shank diameter
- Cycle time: 130 min for 200nm thickness
- Process Temperature : <70C
- Low energy ion cleaning and sharpening of microdrills
- Individual charging/discharging of rotated axes



 **Low CoO**

Basic technology of SNC500



Filtered Laser Arc deposition by carbon evaporation from graphite (HOPG) rotating drum allows to optimize hardness, adhesion and sp³/sp² ratio of ta-C coating :

- Two carbon sources 700 mm height with variable laser ignition frequencies: 60-100Hz
- Pulsed arc current 3000 -7000A/pulse
- Original system of carbon ions transport with dual anodes providing high deposition rate and extremely low quantity of droplets (patented)
- Synchronization of laser pulses, arc discharge current, pulsed bias and dual anodes system.
- Low energy ion etching at low temperature, as well as sharpening of cutting edges of microdrills
- Autocleaning vacuum window for laser beam pass in vacuum



ta-C coating specs

- Hardnes: > 60 GPa
- $sp^3/sp^3 + sp^2 > 65\%$
- Raman ID/IG < 0.26 (measured on drill bits)
- Surface roughness: $Ra < 30$ nm
- Adhesion : Scratch test on tungsten carbide substrate > 18 N

High Drilling performances of ULF coating (drills diameters 0.105 and 0.150)

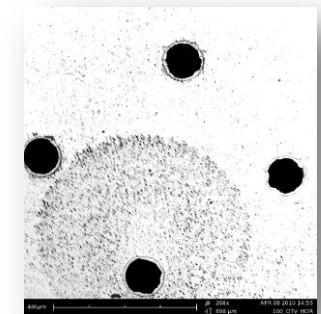


- Extrimely efficient chip evacuation
- Excellent hole quality, hole registration (Cpk) and position accuracy
- Drill bit breakage rate (service live time increase x8)
- Overload infeed breakage (infeed speed increase by factor 2)

Higher chip load drilling is possible with higher productivity and low cost per hole

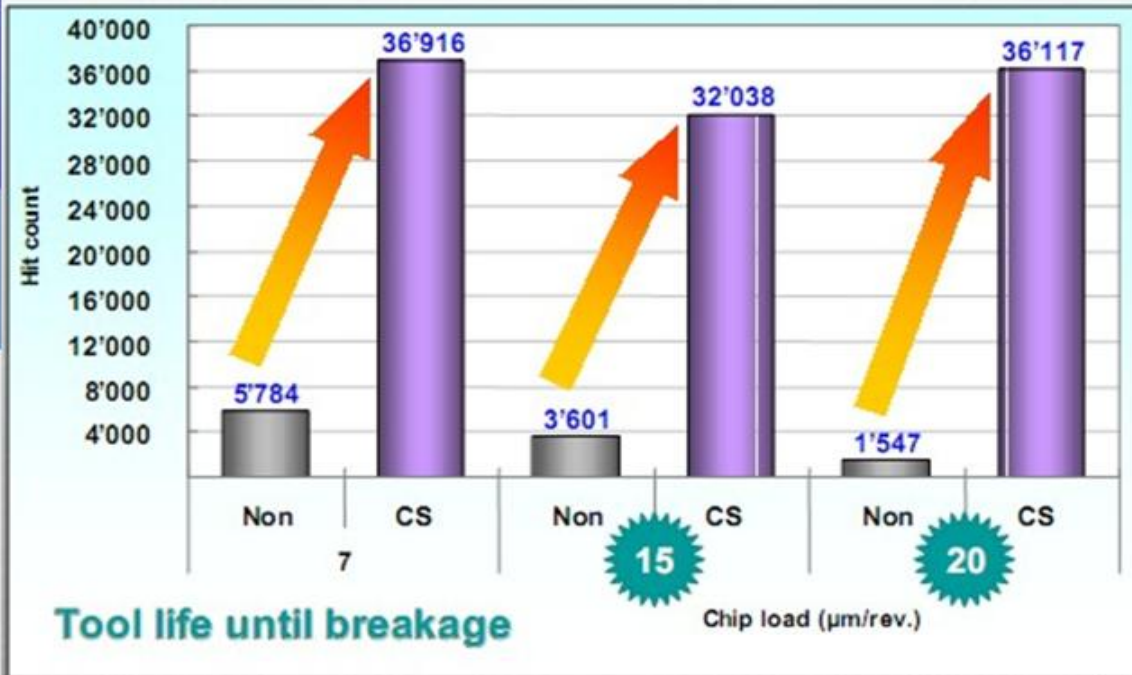
Technology advantages:

- Increase the wear-resistant of the tools
- Increase the velocity of the drilling and milling
- Increase of quality (roughness) the product surface (holes)





Applications...



DRILLING CONDITIONS

PCB: BT HL832HS t. 0.1 mm (Cu:12/12 µm) 4 panels/stack, E/B: LE800, B/B: Paper phenol t. 1.5 mm

Spindle speed: 300 krpm, Hole pitch: 0.25 mm

Drilling machine: Hitachi 1V-212

(Drilling depth into B/B: 0.2 mm)

SNC® ULF coated drills endure strong drilling stress and a reduced cutting torque

- ➔ *Allowing a higher chip load drilling*
- ➔ *For a higher productivity*
- ➔ *An increased hit count for a lower cost per hole!*

Cost of non coated drill bit Ø 0.105 x 1.5 mm: ➔ 100

Hit count achieved: ➔ 1'547 hits

Cost per hole: ➔ 0.065

Cost of coated drill bit Ø 0.105 x 1.5 mm: ➔ 150

Hit count achieved: ➔ 36'117 hits

Cost per hole: ➔ 0.004

Cost saving: ➔ 94%



Non Coated Router / End Mill
~5 m



Coated Router / End Mill
~200 m!



SNC® ULF coated routers / end mills endure strong milling stress and a reduced cutting resistance

- ➔ *Allowing a much longer routing / milling distance*
- ➔ *For a higher productivity*
- ➔ *For a lower cost per routed / milled distance!*

Cost of non coated router / end mill \varnothing 2.0 x 8 mm: ➔ 1
Routing distance achieved: ➔ ~5 meters
Cost per meter: ➔ 20

Cost of non coated router / end mill \varnothing 2.0 x 8 mm: ➔ 1
Routing distance achieved: ➔ ~200 meters
Cost per meter: ➔ 0.5

Cost saving: ➔ 97%

ROUTING / MILLING CONDITIONS

Tested boards: aluminium 1,5 mm, prepreg 80 μ m copper on top 35 μ m - E/B: 1 mm Bakelite / phenol brown - B/B: 2,5 mm white coated melamine non pre-routed - routing depth into B/B: 0.8-0.9 mm

S: 35'000 rpm – F: 0.34 m/min – V: 220 m/min

Routing machine: Rosalux Ultraspeed