DCD

DYNAMIC COMPOUND DEPOSITION

Progressive Coating Technology for
Tribological & Metal Forming Applications

RICHTER PRECISION INC.

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Richter Precision Inc. is North America's preeminent PVD, CVD, TD and DCD coating company. Since 1978, our coatings have been helping customers realize the full potential of their tools, thereby improving the efficiency and profitability of their manufacturing operations. Our one goal is to provide our customers with the best possible coating process and composition for their particular application.

We are pleased to provide Dynamic Compound Deposition (DCD) coating processes as part of our line of tribological coatings. Richter Precision Inc. is currently the only company in North America offering this revolutionary process. Our DCD coatings will unlock the full potential of your tools.

DCD - Standard Coating Data

WHAT IS DCD COATING?

Dynamic Compound Deposition (DCD) is a proprietary low temperature coating process that synthesizes dry-film lubricants and wear resistant coating compositions. DCD is based on the principle of in situ mechanical activation and chemical transformation, and leads to considerably decreased friction coefficients and increased durability of the coating layers. Due to the specific conditions of synthesis, DCD coatings develop micro- and macro-structures that are well adapted for conditions of severe contact loading. For this reason, the DCD process is primarily suited to anti-friction, slide-wear, and high-load applications.

Characteristics of the DCD Process:

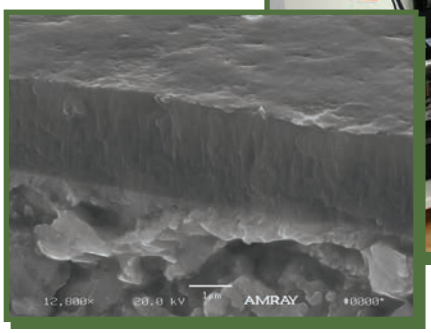
- Low temperature process (< 100°F)
- Low Coefficient of Friction (0.1 or less)
- Thin-film layers (0.5-1.0 microns)
- Suitable for tight tolerances (+/-.0001)
- Relatively fast cycle times
- Deposits well onto most substrates
- No post-coating processing required
- Does not dramatically affect surface finish
- No significant geometry limitations
- Masking is possible, as required

DCD - Standard Coating Data

Name	Composition	Thickness (microns)	Micro-hardness (HV)	Coefficient of Friction	Max. Working Temp.	Process Temp.
Tribo-Kote™ S	(Mo, W) S_2	0.5-1.0	Solid Lubricant	0.08 - 0.1	600°C	100°F / 38°C
Tribo-Kote™ S2	SiC / (Mo, W) S_2	0.5-1.0	1000-1500	0.1	600°C	100°F / 38°C
Tribo-Kote™ S3	SiC / C-DLC	0.5-1.0	1500-3000	0.1	>400°C	100°F / 38°C
Tribo-Kote™ S4	Carbon DLC	0.1-1.0	1500 - 2000	0.1	>400°C	100°F / 38°C
Tribo-Kote™ Sx	Al_2O_3-BN	0.5-1.0	~1000	0.1	>1000°C	100°F / 38°C

Data generated from lab samples. Characteristics may vary depending customer's material, surface condition and part geometry. Additional coating compositions, thicknesses, and processing temperatures are available upon request.

The unique nature of the DCD process allows for the deposition of almost any materials (metals, ceramics, oxides, etc.) The table above represent s our standard productions coatings. Custom processes can be discussed as customer requirements necessitate.



DCD "Combination" Processes - Coating Data

DCD coatings develop micro- and macro-structures that are ideally suited for the conditions of severe contact loading often associated with stamping and forming applications. When a DCD coating is combined with a PVD, CVD or TD coating, you get the wear and abrasion protection of the base coating combined with the extremely low coefficient of friction of the DCD dry-film lubricant layer. This creates a very potent combination, and can greatly improve tool life and performance in most stamping and forming applications.

PVD, CVD and TD coatings all have a surface morphology ideally suited for DCD deposition. As it deposits onto the surface of these coatings, the DCD coating fills the micro-porosity and micro-depressions of the base films. The dry-film lubricant DCD layers that remain in these "low-lying" areas of the base PVD, CVD or TD coating dramatically improves the overall wear characteristics of the coating.

The standard DCD "combination" coatings currently offered by Richter Precision Inc. are as follows:

DCD "Combination" Processes - Coating Data

Name	Composition	Thickness (microns)	Micro-hardness (HV)	Coefficient of Friction	Max. Working Temp.	Process Temp.
Titankote™ C2-SL+S	AlTiN-CrN / (Mo, W) S_2	3-7	3200-3500	0.15	1000°C	375°C / 707°F
Titankote™ C3+S	CrN/CrC/(Mo, W) S_2	3-7	2000-2200	0.15	600°C	375°C / 700°F
Titankote™ C6+S	AlTiN / (Mo, W) S_2	3-7	3000-3400	0.15	300°C	375°C / 700°F
Titankote™ H+S	TiC / (Mo, W) S_2	4-12	3200-3400	0.15	400°C	1050°C / 1925°F
TDkote™+S	VC / (Mo, W) S_2	4-12	3400-3800	0.15	400°C	950°C / 1750° F

Data generated from lab samples. Characteristics may vary depending customer's material, surface condition and part geometry. Additional coating compositions, thicknesses, and processing temperatures are available upon request.

Titankote™ C2-SL+S [AlTiN-CrN/(Mo, W)S_2]

This Super Lattice (SL) coating is comprised of hundreds of alternating nano-layers of AlTiN and CrN. With the addition of the (Mo,W)S2 dry-film lubricant layer this coating is amongst our best PVD coating for metal-forming applications. If material or tolerances do not allow for CVD or TD coating, this one works great..

Titankote™ C3+S [CrN/CrC/(Mo,W)S_2]

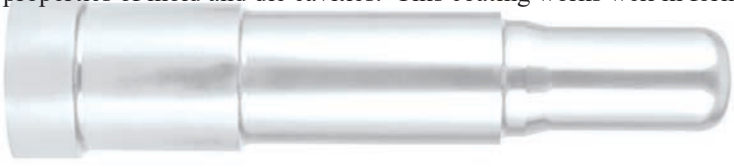
This coating has good hardness, corrosion resistance, and a high resistance to cracking & chipping. The (Mo, W)S_2 dry-film lubricant layer and this coating's natural ductility make it a good choice for metal-forming applications when forming non-ferrous materials, such as aluminum and titanium alloys. PVD processes such as this one should only be used in metal-forming applications when substrates and/or tool tolerances do not allow for either CVD or TD.

Titankote™ C6+S [AlTiN/(Mo, W)S_2]

A great combination coating: the high micro-hardness of the AlTiN layer, combined with the (Mo, W)S_2 dry-film lubricant layer of this coating make it a good choice for many metal-forming applications, especially when under high contact loads. PVD processes such as this one should only be used in metal-forming applications when substrates and/or tool tolerances do not allow for either CVD or TD.

Titankote™ H+S [TiC/(Mo, W)S_2]

This coating has excellent adhesion characteristics that make it a great choice for heavy load applications like metal-forming, stamping, extrusion, and cold-heading. The TiC CVD layer has extremely strong bond strength and provides excellent abrasion resistance. The (Mo, W)S_2 dry-film lubricant layer greatly reduces the friction between tooling and work piece, reduces pick-up of material (adhesive wear/galling), and improves the release properties of mold and die cavities. This coating works well in forming most materials.



TDkote™+S [VC-NbC/(Mo, W)S_2]

This coating provides increased performance for heavy load applications like metal-forming, extrusion, and cold-heading. The (Mo, W)S_2 dry-film lubricant layer of this coating greatly reduces the friction between tooling and work piece, reduces pick-up of material, and improves the release properties. When the tooling substrate and the tolerances allow, this coating works well in forming most materials, especially stainless steels.

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