

Technical Specification of CVD Coatings – Carbon

Graphite, Carbon, Diamond, Nanotubes and DLC (Diamond like Carbon)

Applications

Graphite – used to form molded graphite, carbon foam and carbon fibers.

Carbon – used on pistons, gears, bearings and dies.

Diamond – used for food processing tools, car polish and water resistant coatings.

Nanotubes – used on fuel cells, co-axial cables and electronic devices.

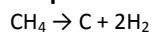
DLC – for use in high wear environments involving seals, molds, metal forming and powder compaction.

Properties

Coating	Graphite	Carbon	Diamond	Nanotubes	DLC
Purity (%)	>99.9	>99.9	99.9	99.9	>99.9
Density (g/cm ³)	2.3	1.8-2.1	3.5	2.2	1.8-2.8
Flexural Strength (MPa)	28	62	300	742	1200
Hardness (Kg/mm ²)	11	55-120	3000	500-1500	2000-9000
Thermal Expansion Coefficient (10 ⁻⁶ /°C)	2-6 (anisotropic)	0.5	2	12	1
Thermal Conductivity (W/mK)	190-390 (anisotropic)	278	2100	6600	400-1000
Electrical Resistivity (Ωcm)	1x10 ⁻³ -3x10 ⁻³	1x10 ² -1x10 ⁶	1x10 ¹² -1x10 ¹⁶	5x10 ⁻⁶ -1x10 ⁻⁴	1x10 ⁵ -1x10 ¹⁵
Standard Thickness	<2mm	<50µm	5mm	<500µm	0.1-5µm
Oxidation Temperature (°C)	600-800	700	450-610	600	500
Friction Coefficient	0.1	0.14	0.05-0.15	0.002-0.07	0.01-0.3
Colour	Black	Black	Clear	Black	Black

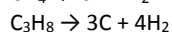
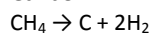
CVD Methods

Graphite



1100°C, 0.001-1atm

Carbon



800-1150°C, 1-150Torr

Diamond



Plasma Activation

Uses Plasma-Assisted Chemical Vapor Deposition (PACVD) or Plasma-Enhanced Chemical Vapor Deposition (PECVD).

Nanotubes

CVD of acetylene over iron based catalysts.

DLC

Deposited at temperatures below 150°C

Like diamond it can be obtained by CVD by plasma action in a hydrocarbon atmosphere.



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