

# Technical Specification of CVD Coatings – Light Metals

## Aluminium (Al), Silicon (Si) and Chromium (Cr)

### Applications

Al – used for turbine blades and casing, bearing housing, valves and piping.

Si – used on optical mirrors, ion implants, wafer bonding and also has plasma nitriding applications.

Cr – used for wear-resistant coatings and decorative applications.

### Properties

Coating	Al	Si	Cr
Purity (%)	>99.9	>99.9	99.0
Density (g/cm <sup>3</sup> )	2.7	2.3	7.2
Flexural Strength (MPa)	110	120	640
Hardness (Kg/mm <sup>2</sup> )	167	1270	1060
Thermal Expansion Coefficient (10 <sup>-6</sup> /°C)	23.1	2.8	6.0
Thermal Conductivity (W/mK)	237	150	93.9
Electrical Resistivity (Ωcm)	2.6x10 <sup>-6</sup>	300	1.25x10 <sup>-9</sup>
Standard Thickness	25-125µm	<100µm	15µm
Oxidation Temperature (°C)	950-980	800	1000
Friction Coefficient	0.61	0.03-0.45	0.55
Colour	Grey	Black-blue	Silver

### CVD Methods

<b>Al</b> Decomposition of (C <sub>4</sub> H <sub>9</sub> ) <sub>3</sub> Al, (C <sub>2</sub> H <sub>5</sub> ) <sub>3</sub> Al, (CH <sub>3</sub> ) <sub>2</sub> AlH or (CH <sub>3</sub> ) <sub>3</sub> Al 200-300°C, up to 1atm	<b>Cr</b> Cr + 2I → Cr + I <sub>2</sub> 700-1000°C, up to 1atm CrCl <sub>2</sub> + H <sub>2</sub> → Cr + 2HCl 1200-1325°C	<b>Si</b> SiH <sub>4</sub> → Si + 2H <sub>2</sub> 750-800°C, 1 -15mTorr 2SiCl <sub>4</sub> + Mo + 2H <sub>2</sub> → MoSi <sub>2</sub> + 4HCl SiCl <sub>4</sub> + 2H <sub>2</sub> → Si + 4HCl 1150-1200°C
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