

Technical Specification of CVD Coatings – Oxides and Mixed

Erbium Oxide (Er₂O₃), Zirconium Oxide (ZrO₂), Yttrium Oxide (Y₂O₃), Yttrium stabilized Zirconium (YSZ), Silicon Oxynitride (SiO_xN_y), and Silicon Oxide (SiO₂)

Applications

Er₂O₃ – used as a hydrogen diffusion barrier.

ZrO₂ – used in hot metal extrusion dies, fuel cell membranes and electric furnace heaters.

Y₂O₃ – used for advanced gel casting processing, luminescent polymer fillers, fluorescent materials, ceramic garnets, and electronics.

YSZ – used for thermal barrier coatings, metal tins, steel drums, dental and bulk bags.

SiO_xN_y – used for highly reflective mirrors and waveguides.

SiO₂ – used for lenses, mirrors, temperature insensitive optical components.

Properties

Coating	Er ₂ O ₃	ZrO ₂	Y ₂ O ₃	YSZ	SiO _x N _y	SiO ₂
Purity (%)	>99.9	97.0	99.9	99.9	99.9	>99.9
Density (g/cm ³)	8.6	5.5-6.0	5.0	6.0	2.2	2.2
Flexural Strength (MPa)	420-430	1050	99	96	125	667
Hardness (Kg/mm ²)	589	1100-1300	585-590	900-1100	1165	600
Thermal Expansion Coefficient (10 ⁻⁶ /°C)	9.2	2.0	9.1	9.9	8.1	0.6
Thermal Conductivity (W/mK)	125	10	14	3.2	20	12
Electrical Resistivity (Ωcm)	10	>10 ¹⁰	>1x10 ¹⁴	1x10 ¹²	5.0-8.0	>1x10 ¹³
Standard Thickness	0.5-1.0µm	0.1-20µm	200nm	240nm	25nm	100nm
Oxidation Temperature (°C)	n/a	n/a	n/a	n/a	n/a	n/a
Friction Coefficient	0.05-0.11	0.6-0.7	0.15	0.6-1.4	0.64-0.75	0.09-0.38
Colour	Pink	Ivory	White	White	Black	Clear

CVD Methods

Er₂O₃:

Er(tmhd)₃ + O₂

200-450°C

ZrO₂:

ZrCl₄ + 2CO₂ + 2H₂ → ZrO₂ + CO + 4HCl

900-1200°C

Decomposition of heptandionate in He above 300°C

Y₂O₃:

YBCO films containing Y₂O₃ precipitates

800°C

YSZ:

Co-deposition of tetremethyl heptadione of zirconium (Zr(C₁₁H₁₉O₂)₃) and yttrium (Y(C₁₁H₁₉O₂)₃).

735°C

SiO_xN_y:

SiO_xN_y is readily prepared by use of any of the precursors used for Si₃N₄ with the addition of either N₂O or NO as an oxygen source.

650-700°C

SiO₂:

SiH₄ + O₂ → SiO₂ + 2H₂

450°C, 1atm

SiCl₄ + 2CO₂ + 2H₂ → SiO₂ + 4HCl + 2CO

200-600°C, <1Torr

SiH₄ + 2O₂ → SiO₂ + 2H₂O

450°C, 1atm

SiCl₂H₂ + 2N₂O → SiO₂ + 2HCl + 2N₂

850-950°C, <1Torr



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