TaC NbC ZrC PBN PG

Metal Carbide Coatings

TaC, NbC, and ZrC coatings resist chemical attack by corrosive liquids and gases at very high temperatures. They are finding increasing acceptance in the sealing and protecting of graphite hardware from hot ammonia, hydrogen, hydrochloric acid, and molten metals used in compound semiconductor epitaxial processes such as MOCVD and LPE.

These carbide coatings are:

- uniform
- impermeable
- electrically conductive
- extremely wear resistant

thus providing long life and low particle generation.

PBN Coatings

PBN has become the material of choice for compound semiconductor crystal growth and wafer processing. PBN coatings also seal and protect graphite from very corrosive atmospheres including most molten metals, all acids, and hot ammonia.

PBN is an electrical insulator which exhibits a high degree of anisotropy, e.g. good thermal conductor parallel ("ab") to substrate and thermal insulator through thickness ("c").

PG Coatings

PG is a popular coating for sealing machined graphite hardware which does not require oxidation protection. It is the most anisotropic commercially available material and is therefore useful where thermal management is important. PG coatings can be applied to PBN crucibles and plates as in Advanced Ceramics' patented "Hot-Lip" MBE crucibles and Boralectric® heaters.

Metal Carbide, PBN and PG Properties

	TaC	NbC	ZrC	PBN	PG
Density, gm/cc	15.0	7.9	6.7	1.95 - 2.22	2.18 - 2.22
Coating Temp., ^{o}C	2100	2100	2100	1600 - 2000	1800 - 2200
Melting Point, ^{o}C	3880	3760	3540	Decomposes @ 2500^{o}C	Sublimes @ 3650^{o}C
Oxidation Limit, ^{o}C	700	800	800	800	400
Thermal Conductivity, W/m ^{o}K	22	13	21	‘‘ab" 20 - 120 ‘‘c" 1.5 - 3.0	‘‘ab" 400 ‘‘c" 3.5
Emissivity (Normal Spectral)	0.5	0.6	0.4	0.5	0.8
CTE, 10^{-6}/^{o}C	6.3	7.0	6.7	‘‘ab" 2.0	‘‘ab" 0.5
Comp. Str., MPa	-	2350	820	220	100
Young's Mod., GPa	300 - 500	350 - 500	350 - 400	22	20
Elec. Res., micro Ω cm	30	30	50	10^{15}	250

Note: Advanced Ceramics will apply coatings on customer-supplied graphite parts or machine, purify and coat parts to your specifications. For optimum coating adherence, please consult with our engineers regarding base graphite grade.

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