SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

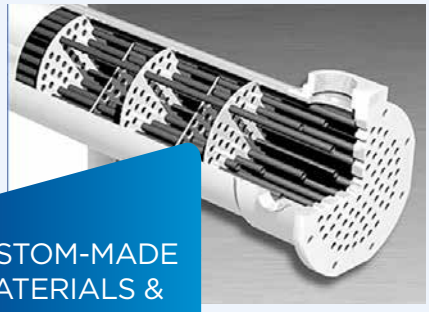
HEXOLOY® SILICON CARBIDE CERAMIC PRODUCTS

FOR SHELL & TUBE HEAT EXCHANGER

SAINT-GOBAIN

SOLUTION

FOR SPECIALTY & FINE CHEMICALS PROCESSING



CUSTOM-MADE MATERIALS & SOLUTIONS

Saint-Gobain Performance Ceramics & Refractories offers Hexoloy® silicon carbide (SiC) ceramic tubes and tube-sheets for shell & tube heat exchangers. Hexoloy® SiC is a single-phase, sintered alpha silicon carbide material offering high purity, fine grain size and extremely low porosity. The tubes offer distinct advantages to enhance the performance of shell and tube heat exchangers used in demanding applications from chemical processing to refineries.

A superior alternative to metals, alloys, glass and graphite tube materials for enhanced heat exchanger efficiency, uptime and reliability.

MEETS TOUGH STANDARDS

- WRC, Water Byelaws Scheme (U.K.)
- DVGW, German Federal Health Office
- FDA, Non Food Additive

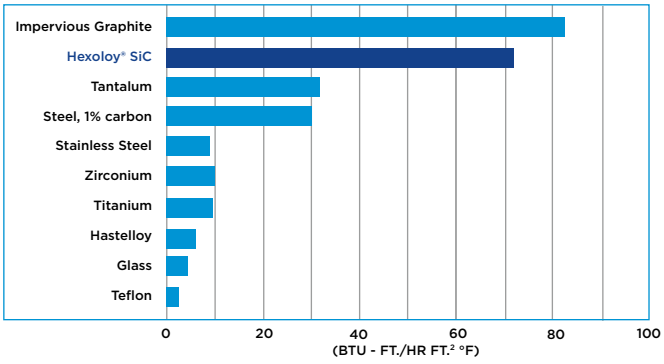
BENEFITS

- **Ultra-long service life**
- **Non-fouling**
- **Reduced down time & maintenance**

FEATURES

THERMAL CONDUCTIVITY

Hexoloy® SiC's thermal conductivity is almost equal to that of commonly used graphite tubes and far better than all other tube materials available. Its thermal conductivity is twice that of tantalum, 5 times that of stainless steel, 10 times that of Hastelloy and 15 times that of glass. The result is higher thermal efficiency while requiring less heat transfer area.



CORROSION RESISTANCE

Hexoloy® SiC is universally corrosion resistant against virtually all chemicals up to 400°F. Hexoloy® SiC tubes have been used for more than 30 years in HF, Sulfuric acid, bromine, high concentration nitric, mixed acids, bases, oxidants and chlorinated organics applications.

Typical Corrosion Resistance

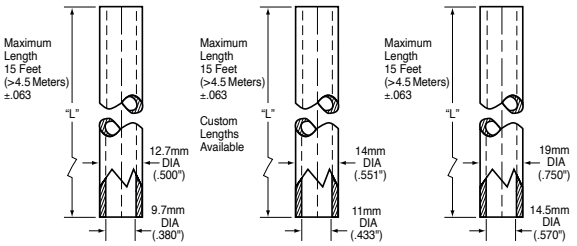
CORROSIVE MEDIUM	TEMPERATURE °F (°C)	HEXOLOY® CORROSION RATE (MG/CM² YR)
98% H_2SO_4	212 (100)	1.8
85% H_3PO_4	212 (100)	<0.2
53% HF	77 (25)	<0.2
50% NaOH	212 (100)	2.5
45% KOH	212 (100)	<0.2
70% HNO_3	212 (100)	<0.2
37% HCl	187 (86)	<0.2
10% HF plus 57% HNO_3	77 (25)	<0.2

HARDNESS & HIGH STRENGTH

Hexoloy® SiC is one of the hardest high performance materials available for heat exchanger tubes. Its density is in excess of 98% of theoretical and Hexoloy® SiC is completely impervious without the use of any impregnants. It is 50% harder than tungsten carbide, so it offers superb erosion resistance and total impermeability at extreme temperature and pressure, and allows higher velocity and improved heat transfer. In fact, every Hexoloy® heat exchanger tube is proof tested up to 186 bar (2,700 psi) to assure reliability and added safety. Hexoloy® SiC's extreme hardness also means no contamination in high purity applications.

TUBES & TUBE SHEETS

Saint-Gobain Performance Ceramics & Refractories supplies **Hexoloy® SE SiC heat exchanger tubes** with lengths up to 4.57 m and outside diameters 12.7 mm, 14 mm and 19 mm to meet specific heat exchanger needs.



Standard Tube Dimensions

100% INSPECT

DIAMETER*
-
WARPAGE*
-
PRESSURE TESTING

Hexoloy® SA SiC tube-sheets are available in diameter up to 600 mm.

PROPERTIES

Physical Poperties	UNITS	HEXOLOY® SA	HEXOLOY® SE
Density	g/cm³	3.10	3.05
Grain Size	microns	4-10	4-10
Hardness (Knoop)**	kg/mm²	2,800	2,800
Flexural Strength 4pt. @ RT	MPa x 10³ lb/in²	380 55	280 40
Compressive Strength @ RT	MPa x 10³ lb/in²	550 80	550 80
Modulus of Elasticity @ RT	GPa x 10⁶ lb/in	430 62	420 60
Weibull Modulus (2 parameter)		8	10
Fracture Toughness @ RT Double Torsion & SENB	MPa/√m 10³lb /in²/√in	4.60 4.20	4.60 4.20
Coefficient of Thermal Expansion RT to 700°C	x 10-6mm/mm°K x 10-6 in/in°F	4.02 2.20	4.02 2.20
Max. Service Temp (air)	°C °F	1,900 3,450	1,900 3,450
Mean Specific Heat @ RT	J/gm˚K	0.67	0.67
Thermal Conductivity @ RT @ 200°C @ 400˚C	W/m°K	125.6 102.6 77.5	125.6 102.6 77.5
Permeability RT to 1000˚C		Impervious to gases over 31 MPa	Impervious to gases over 31 MPa
Electrical Resistivity @ RT*** @ 1000˚C	1000˚C ohm-cm	10^2-10^8 0.01-0.2	10^2-10^8 0.01-0.2
Emissivity		0.9	0.9

* Go, No-Go gage
** Knoop 100-gm load
*** Dopants in Hexoloy® cause fluctuation in resistivity.
N/A = Not applicable or not available

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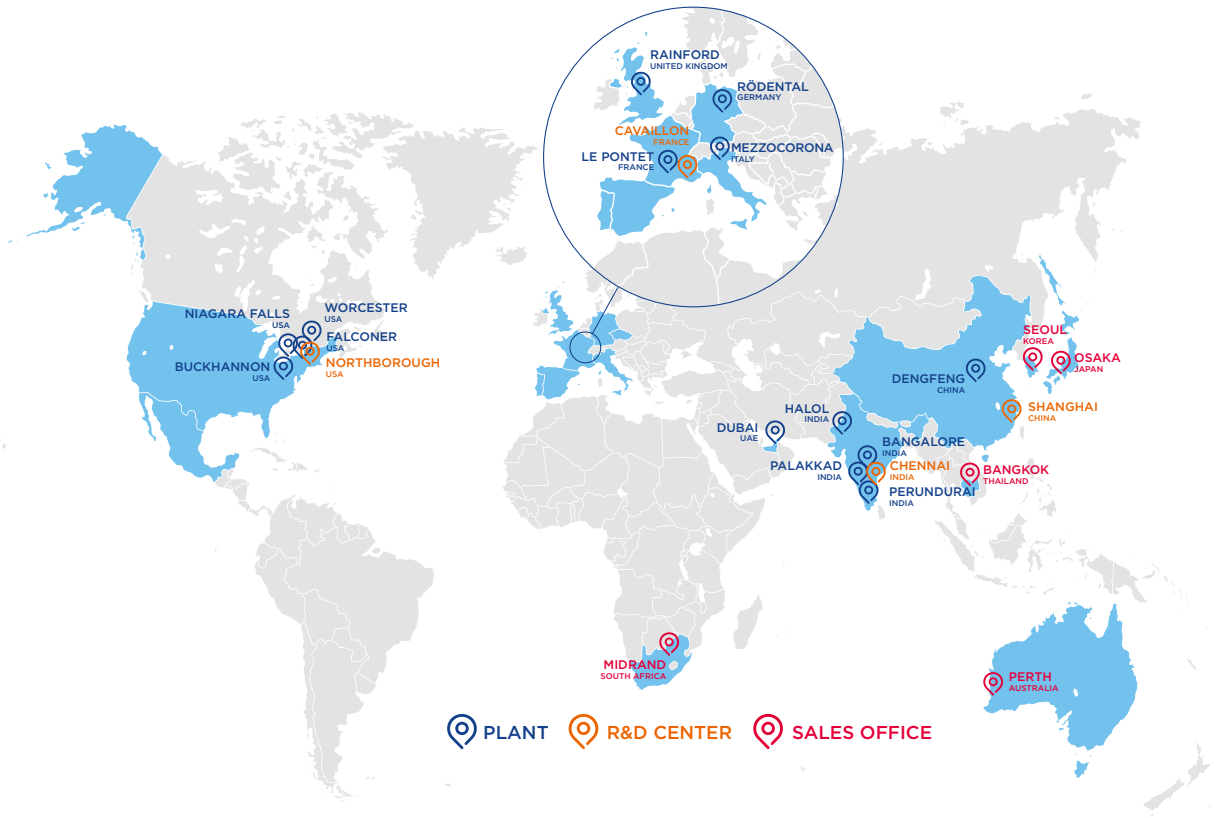
OUR GLOBAL PRESENCE



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