High Purity Fused Quartz Boat For High Temperature Tube Furnaces And Semiconductor Processing

Item Number: KT-SYP

Introduction

Engineered for high temperature tube furnace applications, this high purity fused quartz boat provides exceptional thermal shock resistance, minimal trace contamination, superior chemical stability, and reliable performance across semiconductor diffusion, chemical vapor deposition, powder sintering, and advanced materials synthesis.

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Application	Description	Key Benefit
Semiconductor Wafer Diffusion & Doping	Holds silicon and compound semiconductor substrates inside horizontal quartz process tubes during high-temperature dopant drive-in and oxidation routines.	Ultra-low alkali metal and transition metal concentrations eliminate wafer contamination and preserve minority carrier lifetimes.
Chemical Vapor Deposition (CVD & PECVD)	Acts as a stable substrate and precursor vessel for graphene, carbon nanotube synthesis, 2D transition metal dichalcogenide growth, and thin-film coatings.	Withstands reactive precursor gases and elevated thermal conditions without outgassing or catalyzing undesirable side reactions.
Lithium-Ion Battery Material Calcination	Contains active cathode powders, solid-state electrolytes, and anode precursors during high-temperature atmospheric or vacuum thermal baking.	Prevents iron, sodium, and heavy metal cross-contamination, ensuring pristine electrochemical capacity and cycling stability.
High-Temperature Powder Metallurgy & Sintering	Carries metallic, ceramic, and composite powder compacts through reduction furnaces under controlled hydrogen, argon, or vacuum atmospheres.	Maintains planarity under thermal load without adhering to or chemically bonding with metallic melts and sintered ceramics.
Phosphor & Optical Crystal Synthesis	Serves as a reaction chamber for rare-earth doped luminescent phosphors, laser crystals, and scintillation materials undergoing prolonged thermal soaking.	High optical transmission and inert reaction boundaries prevent discoloration and preserve optimal luminescence quantum efficiency.
Analytical Ashing & Combustion Analysis	Accommodates organic, environmental, and geological samples during high-temperature combustion and gravimetric residue determinations.	Total dimensional stability and mass constancy under thermal cycling guarantee precise analytical measurement accuracy.
Precious Metal Refining & Pyrometallurgy	Houses gold, platinum-group metals, and high-purity catalysts during thermal purification, halogenation, and flux-assisted smelting reactions.	Resists acid condensates and aggressive metallurgical fluxes, ensuring maximum precious metal recovery rates without container degradation.
Catalytic Gas-Solid Heterogeneous Reactions	Houses packed catalyst pellets and porous reactant beds in tubular reactors exposed to continuous flowing reactant gases at elevated temperatures.	Non-porous vitreous walls channel gas streams without bypass leakage or catalytic surface deactivation.

Model Identifier	Outer Length (mm)	Outer Width (mm)	Outer Height (mm)	Wall Thickness (mm)	Usable Volume (mL)	Handle Configuration
KT-SYP-50	50 ± 1.0	20 ± 0.5	15 ± 0.5	2.0 ± 0.2	10	Flat Rim / Rimless
KT-SYP-80	80 ± 1.0	25 ± 0.5	18 ± 0.5	2.0 ± 0.2	25	Integrated Quartz Hook
KT-SYP-100	100 ± 1.5	30 ± 0.8	20 ± 0.8	2.5 ± 0.3	45	Integrated Quartz Hook
KT-SYP-120	120 ± 1.5	35 ± 0.8	22 ± 0.8	2.5 ± 0.3	70	Integrated Quartz Hook
KT-SYP-150	150 ± 2.0	40 ± 1.0	25 ± 1.0	2.5 ± 0.3	115	Integrated End Loop

ModelIdentifier	Outer Length (mm)	Outer Width (mm)	Outer Height (mm)	Wall Thickness (mm)	Usable Volume (mL)	Handle Configuration
KT-SYP-200	200 ± 2.0	50 ± 1.0	30 ± 1.0	3.0 ± 0.3	220	Dual End Handles
KT-SYP-SLOT	120 ± 1.5	40 ± 1.0	30 ± 1.0	2.5 ± 0.3	Custom	Multi-Slot Wafer Carrier (10–25 Substrates)

Property Specification	Nominal Metric Value	Testing Standard / Operational Condition
Silicon Dioxide (SiO2) Purity	≥ 99.99%	Chemical assay and emission spectroscopy
Continuous Working Temperature	1150°C to 1200°C	Oxidizing, inert, or vacuum furnace environments
Maximum Short-Term Operating Limit	1300°C	Intermittent thermal peak (duration ≤ 30 min)
Softening Point	~1680°C	ASTM C338 standard test method
Annealing Point	~1210°C	ASTM C336 standard test method
Strain Point	~1120°C	ASTM C336 standard test method
Coefficient of Thermal Expansion (CTE)	5.5×10^{-7} /°C	Dilatometric measurement (20°C to 1000°C)
Bulk Density	2.20 g/cm³	Standard pycnometry at 20°C
Mohs Hardness	6.5 – 7.0	Scratch hardness scale
Compressive Strength	1100 MPa	Ambient temperature compressive failure test
Flexural Tensile Strength	48 MPa	Three-point bending verification
Dielectric Constant	3.75	Capacitance method at 1 MHz, 20°C
Optical Transmission Bandwidth	190 nm to 2500 nm	> 90% transmission in visible spectrum
Hydroxyl (OH^-) Concentration	< 15 ppm	Low-OH synthetic grade options available (< 5 ppm)

Element Symbol	Maximum Threshold (ppm)	Elemental Impact Analysis
Aluminum (Al)	≤ 14.0	Network-forming component; restricted to maintain high viscosity
Iron (Fe)	≤ 0.8	Suppressed to eliminate thermal discoloration and devitrification nucleation
Calcium (Ca)	≤ 0.6	Controlled to prevent alkaline-earth surface crystallization at high temperatures
Magnesium (Mg)	≤ 0.3	Kept minimal to avoid fluxing interactions during long-duration thermal soaks
Sodium (Na)	≤ 1.0	Critical control limit to eliminate mobile ion diffusion into silicon wafers
Potassium (K)	≤ 0.8	Controlled to prevent vapor-phase alkali migration in tube furnace lines
Titanium (Ti)	≤ 1.1	Limited to maintain high UV-visible optical transmittance
Copper (Cu)	≤ 0.1	Strictly bounded to preserve semiconductor minority carrier lifetimes
Nickel (Ni)	≤ 0.1	Suppressed to prevent metallic catalytic micro-inclusions in synthetic processes

Process Atmosphere / Chemical Agent	Compatibility Assessment	Operating Guidelines and Boundary Conditions
Inert Gases (Ar, N2, He)	Fully Compatible	Stable across the entire operating range up to 1200°C continuous
High Vacuum (< 10^{-5} mbar)	Fully Compatible	Negligible outgassing; maintain below 1150°C to avoid structural deformation
Oxidizing Environments (Air, O2)	Fully Compatible	Chemically inert; ideal for ashing, oxidation, and calcination up to 1200°C
Reducing Atmospheres (H2, Forming Gas)	Compatible with Conditions	Safe up to 1100°C; avoid exceeding 1150°C in pure dry hydrogen to prevent reduction
Concentrated Hydrofluoric Acid (HF)	Incompatible	Reacts readily with silicon dioxide; avoid contact with any HF solutions
Hot Concentrated Phosphoric Acid	Incompatible	Causes accelerated surface etching at temperatures above 150°C
Alkaline Solutions (NaOH, KOH)	Conditional Use	Tolerated at room temperature; rapid chemical dissolution occurs above 80°C