

Complete THERMAL MANAGEMENT

Chemical Purity

| ppm | Li | Na | K | Mg | Ca | Fe | Cu |
|------|-----|-----|-----|-------|-----|-----|-------|
| HBQ® | 0.1 | 0.1 | 0.2 | <0.03 | 0.4 | 0.2 | <0.01 |

Chemical Inertness



Acids

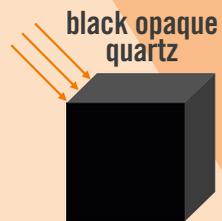
H₂O
H₂SO₄
HNO₃
HCl
H₃PO₄
Organic



Gases

H₂
O₂
N₂
HCl
NH₃
Cl₂

Complete Thermal Management



full heat radiation control

clear fused quartz

white opaque quartz

Heraeus

STEP INTO A NEW WORLD OF POSSIBILITIES

HCA-SemiIQ_9.0/E/07.2019

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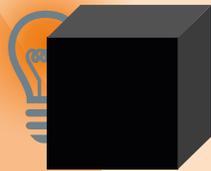
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Heraeus Black Quartz HBQ®

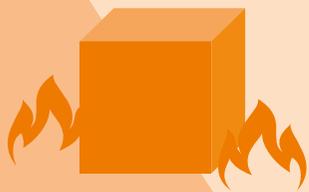
a revolutionary hybrid material

Unique MATERIAL PROPERTIES



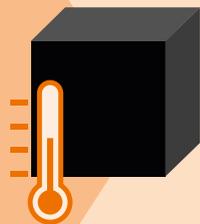
High optical absorption

Over 95% absorption is achieved in as little as 3mm of thickness across a wide range of wavelengths from UV through VIS to MWIR. Over 80% absorption can be achieved at thicknesses of just 1mm.



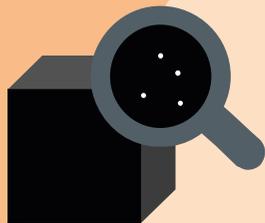
High emissivity

Values for emissivity close to a black body emitter are achieved at elevated temperatures resulting in an emissivity between 80% and 90% through a wide range of wavelengths. Peaking between 2.6 μ m and 2.7 μ m at 95%, HBQ[®] represents a new option as black body emitter.



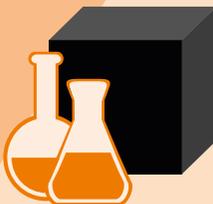
Low thermal conductivity

Despite the high emissivity of HBQ[®], the SiO₂ nature of the material results in a very low thermal conductivity, as low as 1.5 W/mK. This unique combination of thermal properties provides an unusual degree of freedom in thermal management where heat dissipation is an issue such as semiconductor process chambers.



Ultra high purity

The total level of impurities in HBQ[®] is <50 ppm, resulting in a class leading bulk purity of >99.995% making it perfect for the most sensitive leading-edge semiconductor applications. Additionally HBQ[®] is free of carbon and problem metals like Iron, Titanium, Tungsten, Chrome or Nickel.



Chemical inertness

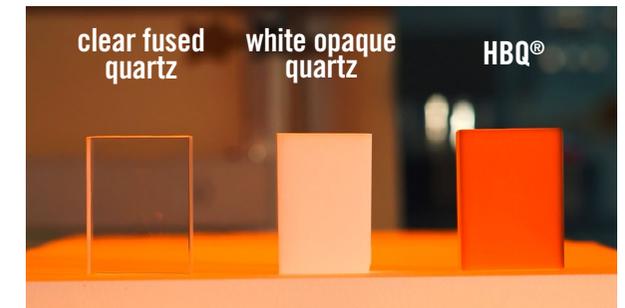
HBQ[®] is inert to most chemical acids and solvents. As typified with clear fused quartz no reaction is seen with HCl, HNO₃ or gases like Cl₂, H₂ or O₂. In almost any atmosphere HBQ[®] can be used at temperatures up to 1300°C safely and reliably.

High CHEMICAL INERTNESS

Multiple Geometries and Dimensions



Emissivity Comparison at 1000°C



HBQ[®]100 – Physical Properties

| | |
|--|-----------------------|
| Density g/cm ³ | 2.19 – 2.20 |
| Porosity | < 0.5% |
| Pore size | < 10 μ m |
| CTE (0...900°C) | 0.57 $\times 10^{-6}$ |
| Max. working temp. – continuous | 1160°C |
| Max. working temp. – short term | 1300°C |
| Specific heat [J/(gK)], RT | 0.75 |
| Heat conductivity [W/(mK)], RT | 1.49 |
| Dielectric constant (ϵ), RT, 13.56 MHz | 3.82 |
| Dielectric loss angle (tan δ), RT, 13.56 MHz | 90 $\times 10^{-4}$ |