

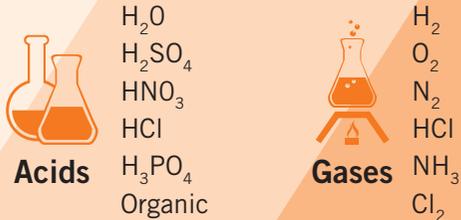
# Complete THERMAL MANAGEMENT

Heraeus

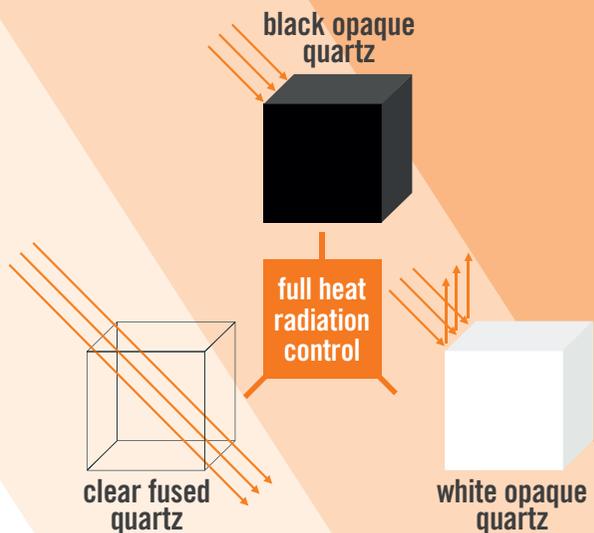
## Chemical Purity

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



## Complete Thermal Management



## STEP INTO A NEW WORLD OF POSSIBILITIES



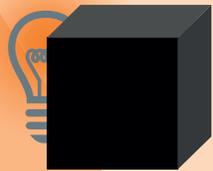
The data given here is correct for February 2018 and is subject to change. HQS-BM\_25-1/E/02.2018

### CONTACT

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**Heraeus Black Quartz HBQ®**  
 a revolutionary hybrid material

# Unique MATERIAL PROPERTIES



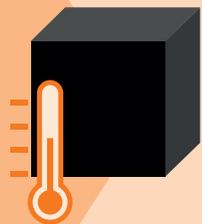
**High optical absorption**

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.



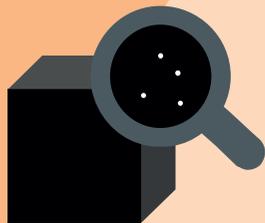
**High emissivity**

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 $\mu$ m and 2.7 $\mu$ m at 95%, HBQ<sup>®</sup> represents a new option as black body emitter.



**Low thermal conductivity**

Despite the high emissivity of HBQ<sup>®</sup>, the SiO<sub>2</sub> 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<sup>®</sup> 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<sup>®</sup> is free of carbon and problem metals like Iron, Titanium, Tungsten, Chrome or Nickel.



**Chemical inertness**

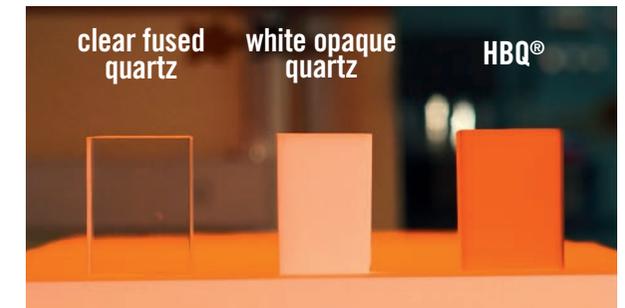
HBQ<sup>®</sup> is inert to most chemical acids and solvents. As typified with clear fused quartz no reaction is seen with HCl, HNO<sub>3</sub> or gases like Cl<sub>2</sub>, H<sub>2</sub> or O<sub>2</sub>. In almost any atmosphere HBQ<sup>®</sup> can be used at temperatures up to 1300°C safely and reliably.

# High CHEMICAL INERTNESS

## Multiple Geometries and Dimensions



## Emissivity Comparison at 1000°C



## HBQ<sup>®</sup>100 – Physical Properties

Density g/cm <sup>3</sup>	2.19 – 2.20
Porosity	< 0.5%
Pore size	< 10 $\mu$ m
CTE (0...900°C)	0.57 $\times$ 10 <sup>-6</sup>
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 ( $\epsilon$ ), RT, 13.56 MHz	3.82
Dielectric loss angle (tan $\delta$ ), RT, 13.56 MHz	90 $\times$ 10 <sup>-4</sup>