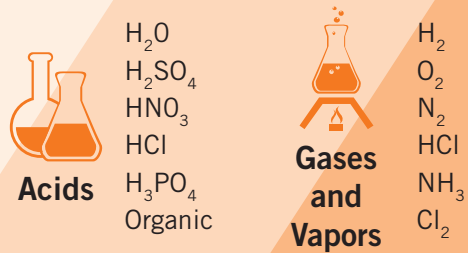


# Complete THERMAL MANAGEMENT

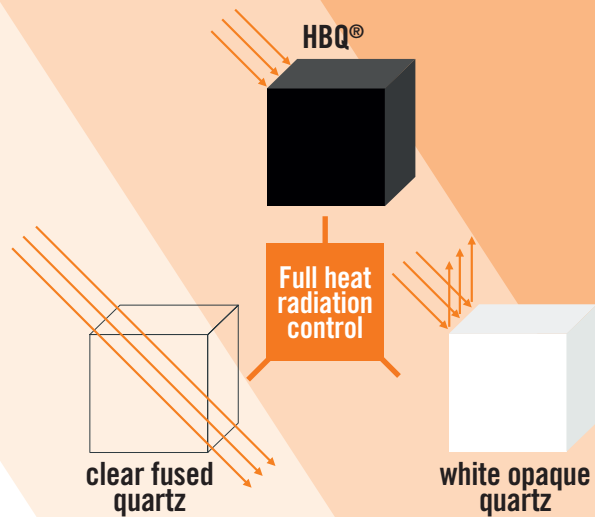
## Chemical Purity

ppm	Li	Na	K	Mg	Ca	Fe	Cu	Cr
HBQ®	0.1	0.1	0.2	0.03	0.4	0.3	0.01	0.01

## Chemical Inertness against



## Complete Thermal Management



Heraeus  
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## STEP INTO A NEW WORLD OF POSSIBILITIES



The data given here is correct for September 2017 and is subject to change. HQS-BM\_25 0/E/09.2017

### CONTACT

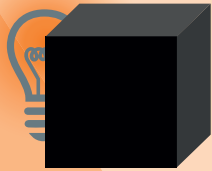
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**Heraeus Black Quartz HBQ®**  
a revolutionary hybrid material

# Unique MATERIAL PROPERTIES



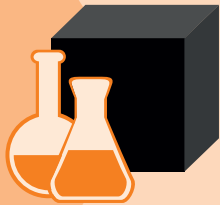
**High Optical Absorption**

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



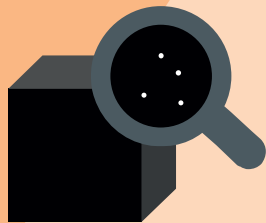
**High Emissivity**

Values for emissivity close to a black body emitter are achieved at elevated temperatures. Over a wide range of wavelength the emissivity is between 80% and 90%. Between 2.6 $\mu$ m and 2.7 $\mu$ m reaching 95%. HBQ<sup>®</sup> represents a new option as black body emitter.



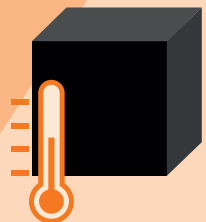
**Chemical Inertness**

Analogous to clear fused quartz material HBQ<sup>®</sup> is inert to most chemical acids and solvents. For example 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.



**Ultra High Purity**

The total level of impurities in HBQ<sup>®</sup> is <50 ppm, resulting in a bulk purity of >99.995%. Even for the most sensitive leading-edge semiconductor applications HBQ<sup>®</sup> is a qualified and viable material solution. HBQ<sup>®</sup> is free of carbon and problem metals like Iron, Titanium, Tungsten, Chrome or Nickel.

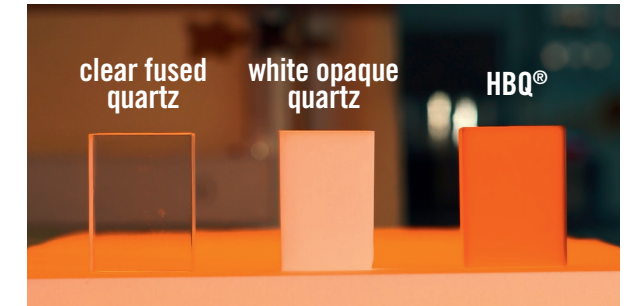


**Low Thermal Conductivity**

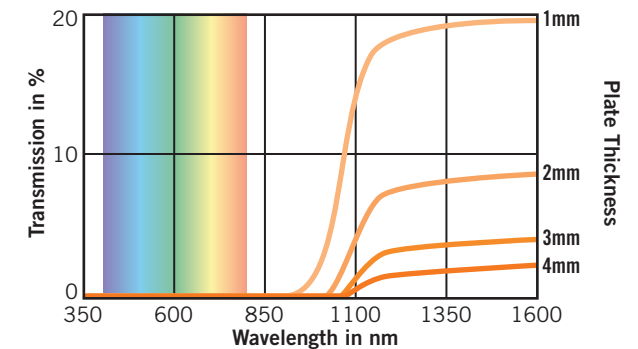
Despite the high emissivity, HBQ<sup>®</sup> offers a very low thermal conductivity, defined by the SiO<sub>2</sub> nature of the material. The thermal conductivity is as low as 1.5 W/mK. This offers unique application benefits, e.g. in semiconductor process chambers, adding a degree of freedom in thermal management, where heat dissipation is an issue.

# High CHEMICAL INERTNESS

## Emissivity Comparison at 1000°C



## Transmission of HBQ<sup>®</sup> Plates from UV to IR



## 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 $\times 10^{-6}$
Max. Working Temp – continuous	1120°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 $\times 10^{-4}$