

Quartz

SiO_2

◆ Key Properties of Quartz (SiO_2)

- 🌈 Broad UV–NIR Transmission: Excellent clarity from ~180 nm to 3.5 μm .
- 🔍 Low Refractive Index: ~1.46 at 589 nm with smooth, stable dispersion across the UV–NIR range.
- 🔥 High Thermal Stability: Very low thermal expansion and strong temperature resistance for demanding optical systems.
- 🧪 Chemically Durable: Non-hygroscopic and resistant to most chemicals, ideal for laboratory and industrial environments.
- 🔬 Laser-Compatible: High laser-damage threshold makes quartz suitable for UV–NIR laser windows and optics.
- 🦚 High Optical Purity: Low inclusions and excellent homogeneity for precision imaging and metrology.
- ⚙️ Versatile Material: Used for windows, lenses, prisms, and components across UV/visible/NIR analytical systems.

🔧 Applications of Quartz (SiO_2)

- 🔬 UV-Visible Spectroscopy: Ideal for cuvettes, windows, and optical components requiring deep-UV to visible transmission.
- 💡 Laser Optics & Beam Delivery: Suitable for UV-NIR laser windows, viewports, and high-energy optical paths.
- ▢ Precision Windows & Viewports: Used in analytical instruments, imaging systems, and metrology equipment.
- 🏭 Semiconductor & Lithography Systems: Applied in photomask substrates, inspection optics, and wafer-processing tools.
- 🔍 Scientific Imaging & Metrology: Excellent for precision measurement systems requiring high homogeneity.
- 🌡️ High-Temperature Applications: Used in furnace viewports, lamp envelopes, and thermal monitoring systems.
- 🧪 Chemical & Industrial Processing: Resistant to moisture and chemicals, suitable for flow cells and analytical setups.
- ⚙️ General UV/Visible/NIR Optics: Common for lenses, prisms, light guides, and protective optical elements.

Technical Parameters of Quartz (SiO₂)

Property	Typical Value
Transmission Range	180 nm – 3.5 μm
Refractive Index	1.46 @ 589 nm
Density	2.20 g/cm ³
Melting Point (Softening)	~1665 °C
Hardness (Knoop)	~500–550 kg/mm ²
Thermal Expansion	0.55 × 10 ⁻⁶ /°C (very low)
Crystal Type	Amorphous (fused silica/quartz)
Hygroscopic	No (non-hygroscopic)
Chemical Formula	SiO ₂
Applications	UV-visible spectroscopy, laser windows, metrology optics, semiconductor tools, precision imaging, scientific instrumentation

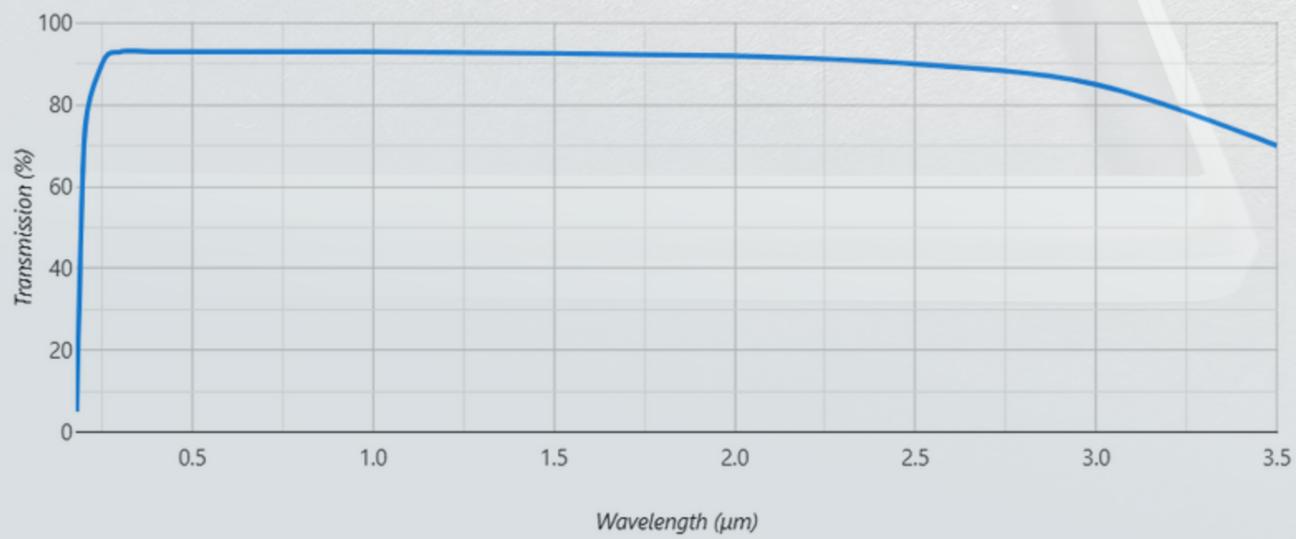
Quartz (SiO₂) is a versatile optical material with excellent transmission from 0.18–3.5 μm, making it ideal for UV-visible optics, laser systems, spectroscopy, metrology, and high-temperature viewports. Its moderate refractive index (~1.46) and stable dispersion provide reliable performance across UV, visible, and near-IR applications.

Quartz is non-hygroscopic and highly resistant to heat, abrasion, and chemicals, allowing it to operate in harsh industrial, laboratory, and outdoor environments. As a durable crystalline material with intrinsic birefringence, Quartz is well suited for windows, lenses, prisms, waveplates, and laser components, offering excellent stability and long-term optical clarity for precision optical systems.

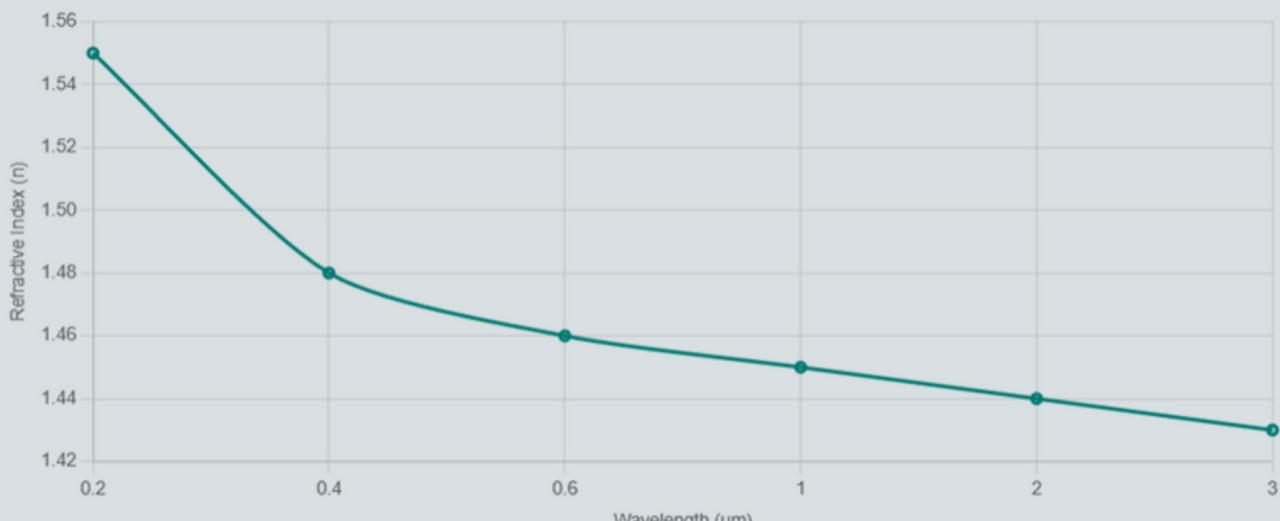


Quartz (SiO_2) – Optical & Thermal Graphs

Quartz Transmission (0.18–3.5 μm)



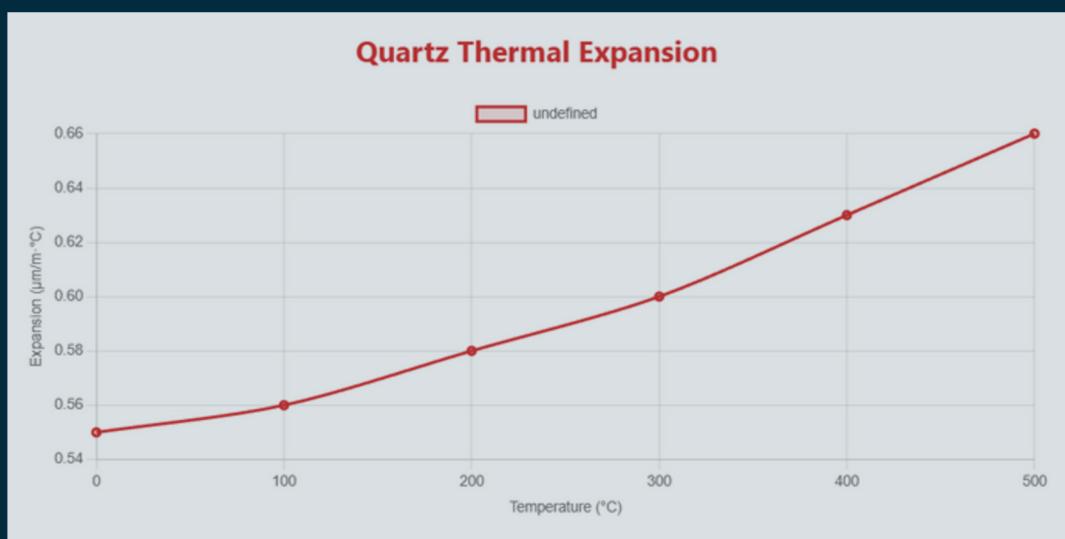
Quartz Refractive Index



Quartz (SiO_2) provides excellent optical transmission from 0.18 μm to 3.5 μm , covering the deep-UV, visible, and near-IR regions. With its moderate refractive index (~1.46) and stable dispersion, Quartz is well suited for UV–VIS spectroscopy, laser systems, metrology instruments, semiconductor equipment, and broadband UV–IR optical components.

Quartz offers outstanding thermal and mechanical stability, delivering reliable optical performance for laboratory, industrial, and high-precision applications. As a hard, durable crystalline material with intrinsic birefringence, it can be manufactured into windows, lenses, prisms, waveplates, and laser optics, providing high optical clarity and long-term stability across UV and visible wavelengths.

Being non-hygroscopic and chemically inert, Quartz is easy to handle and performs well in outdoor, high-temperature, and demanding environments, making it a dependable choice for UV–VIS spectroscopy, high-power laser systems, optical metrology, and precision imaging platforms.



FAQ

Q: What is Potassium Bromide (KBr) used for?

A: Potassium Bromide is widely used in FTIR spectroscopy, gas-analysis cells, environmental monitoring systems, and mid- to far-IR optical instruments, thanks to its extremely broad 0.25–25 μm transmission.

Q: What makes KBr different from other infrared materials?

A: KBr provides exceptionally wide IR transparency with a low refractive index and smooth dispersion, making it ideal for deep-IR spectroscopy. However, unlike durable non-hygroscopic materials, KBr is highly hygroscopic and requires dry handling and storage.

Q: Is Potassium Bromide hygroscopic?

A: Yes. KBr is strongly hygroscopic and readily absorbs moisture, which can cause fogging and surface degradation. It must be kept in sealed or desiccated environments.

Q: Is KBr suitable for FTIR and mid-IR spectroscopy?

A: Absolutely. KBr is one of the most widely used materials for FTIR windows, beamsplitters, sample cells, and analytical infrared optics due to its very broad and uniform IR transmission.

Q: What types of optical components can be made from KBr?

A: KBr can be fabricated into windows, prisms, plates, beamsplitters, and gas-cell components, especially for laboratory and analytical instrumentation.

Q: How durable is Potassium Bromide?

A: Optically, KBr performs extremely well, but it is soft, easily scratched, and moisture-sensitive. For this reason, it is typically used in protected mounts or dry environments.

Q: Can KBr optics be anti-reflection coated?

A: Yes, but coatings must be compatible with hygroscopic materials. KBr optics are often supplied with protective coatings or housed in sealed assemblies to increase lifespan and reduce moisture exposure.

Q: Is KBr safe to handle?

A: Yes. KBr is non-toxic and safe to handle, but it must be protected from moisture. Use dry gloves, low-humidity environments, and sealed storage for best optical performance.