

SIMPLE

Home (/) > Products (https://www.montanainstruments.com/Products/) > Accessories (https://www.montanainstruments.com/Accessories/) > Window Materials (https://www.montanainstruments.com/Accessories/Windows/)

# WINDOW MATERIALS

On most systems, both the outer vacuum housing (warm) and inner radiation shield (cold) windows may be easily replaced by the user within minutes. A variety of optical materials are available for different wavelengths and applications. The standard option is a VIS-NIR (400-1000nm) with Anti-Reflective (AR) coating.

The size of and number of optical windows is determined by the outer housing configuration - please refer to your system specifications for window sizing and quantities. See the Window Buyers Guide (https://www.montanainstruments.com/help/Windows-Buyers-Guide/) for more information on replacement windows.

Window Substrate	Wavelength	Application Notes
Fused silica VIS-NIR coated	400 - 1000nm	Standard windows
Fused Silica uncoated	200 - 2000nm	
BK7 (Borosilicate Crown Glass)	350nm - 2µm	
Sapphire	300nm - 4µm	Birefringent!
Calcium Fluoride (CaF2)	200nm - 8µm	
Potassium Bromide (KBr)	250nm - 26µm	Hygroscopic
Germanium (Ge)	3 - 12µm	
Silicon (Si)	1.2 - 7µm	
Sodium Chloride (NaCl)	300nm - 10µm	Water-soluble!
Zinc Selenide (ZnSe) uncoated	0.7 - 20µm	Only 70% transmission
Zinc Selenide (ZnSe) 3-12µm coating	3 - 12µm	Only 95% transmission
TPX (Polymethyl-pentene)	80µm - 2mm	for THz work, 80% transmission
HRFZ-Si	100µm - 1mm	for THz work, 55% transmission
Crystal Quartz	100µm - 1mm	for THz work, minimal birefringence
Spectrosil 2000	190 - 2000nm	deep UV, fluorescence
BaF2	3 - 5µm	ultraviolet transmission
Aluminized Kapton		for X-Ray work
Other		user specified

Not all windows are available in all sizes. Typical sizes required are 50mm, 30mm, and 20mm. The low working distance option has a very thin window and can be coated fused silica, BK7, or sapphire.

#### Fused Silica (Uncoated/Coated)

Made from UV-grade synthetic fused silica. Applications include laser set-ups (i.e. at Brewster's angle), emitter/detector protection devices (such as in spectrophotometers), and imaging systems involving ultraviolet wavelengths. These windows are typically used for both the inner and outer windows of the sample chamber unless specified otherwise. Figure 1 below is a transmission curve for the uncoated substrate. This standard substrate is available with various antireflection coatings. These coatings reduce the surface losses at these wavelengths. The curves in Figure 2 indicate the coated surface losses. You can estimate transmission by doubling these curves and subtracting from 100%. Outside these bands, the transmission of a coated surface is not predictable.



**Cookies: Accepted** 

Figure 1: Transmission curve for uncoated substrate (Source: Edmund Optics (https://www.edmundoptics.com/))

#### Surface Loss Curves

Standard VIS-NIR Coating



#### **Optical UV Coating**



#### **Optical UV-VIS Coating**



Figure 2: Reflection curve for coated substrates. Transmission percentage can be estimated by (100-2\*R)% (Source: Edmund Optics (https://www.edmundoptics.com/))

#### BK7

These windows are well suited for low power laser applications. They have low distortion and low dispersion. These are available at 0.2mm thick and can be used for low working distance applications.



(Source: Edmund Optics (https://www.edmundoptics.com/))

#### Sapphire

These windows are made from single crystal sapphire, with extreme surface hardness, and high thermal conductivity. Sapphire is the second hardest crystal next to diamonds and, because of their structural strength, sapphire windows can be made much thinner than other common dielectric windows with improved transmittance in a transmission range from 0.15 - 5.5µm. However, these windows are birefringent which will affect the polarization of incident light.



Transmission Curve For Sapphire Windows

(Source: Edmund Optics (https://www.edmundoptics.com/))

#### **Calcium Fluoride**

Calcium fluoride is often used in spectroscopic windows and lenses due to its high transmission from 250nm - 7µm. Its low absorption and high damage threshold makes it a popular choice for excimer laser optics. Calcium fluoride's low index of refraction allows it to be used without an anti-reflective coating.



(Source: Edmund Optics (https://www.edmundoptics.com/))

### **Potassium Bromide (KBr)**

Potassium Bromide (KBr) is commonly used in FTIR spectroscopy. KBr has a slightly larger spectral range than Sodium Chloride (NaCl) and has excellent transmission from 250nm – 26µm. KBr is water soluble and its surfaces should be protected from exposure to moisture.



(Source: Edmund Optics (https://www.edmundoptics.com/))

#### Silicon (Si)

Silicon windows are popular for the 1.2 -  $7\mu m$  spectral region.



(Source: Edmund Optics (https://www.edmundoptics.com/))

#### Zinc Selenide (ZnSe)

Zinc Selenide windows are ideal for a wide variety of infrared applications including thermal imaging, FLIR, and medical systems. This chemically vapor deposited material has wide usage in high power CO2 laser systems because of its low absorption coefficient and high resistance to thermal shock. Zinc selenide (ZnSe) is a relatively soft material that scratches easily. When handling, wear Latex gloves to prevent contamination. Special care should be taken when handling Zinc Selenide as it is a toxic material.



(Source: Edmund Optics (https://www.edmundoptics.com/))

#### HRFZ-Si

High Resistivity Float Zone Silicon for Terahertz applications.



(Source: TYDEX Optics (http://www.tydexoptics.com/))

#### TPX

TPX is optically transparent in UV, visible, and THz ranges, allowing using a HeNe laser beam for alignment. TPX windows are used in cryostats as "cold" windows as the THz transparency does not change in dependence on temperature. Note: TPX windows are not completely vacuum tight, resulting in a temperature increase of approximately 1K.



(Source: TYDEX Optics (http://www.tydexoptics.com/))

#### **Z-Cut Crystal Quartz**

Z-cut crystal quartz is transparent in the visible range allowing easy adjustment with a HeNe laser beam and does not change the state of light polarization.



(Source: TYDEX Optics (http://www.tydexoptics.com/))

## Aluminized Kapton

These windows are suitable for x-ray work. They consist of a 0.005" thick Kapton layer, aluminized on each side with 300 Angstroms of aluminum. This window is made custom by Montana Instruments in 30mm and 50mm sizes.

#### **Exploded Window Assembly**

# FILES

• Dimensions - Acceptance Angle 50mm Windows (https://www.montanainstruments.com/library/files/Acceptance-Angle-Dimensions-50mm.pdf)

(https://www.linkedin.com/company/montana-instruments) (/Contact/Newsletter-Signup/)