DuraBeryllium® x-ray windows

Mounted DuraBeryllium X-ray windows

Applications

- Microanalysis
- EDXRF
- WDXRF
- XRD

Standard window sizes

Thickness (µm)	Diameter (mm)
8.0	9.2
12.5	12.0
25.0	9.2

Other common sizes are also available but may require a longer lead time.

Thickness (µm)	Diameter (mm)
8.0	4.9
8.0	5.7
8.0	7.9
8.0	12.0
12.5	16.0
25.0	16.0

Features	Benefits
DuraCoat®	Corrosion resistance, hermetic seal
DuraCoat® Plus	Maximum corrosion resistance
Thin Beryllium	High transmission of low energy x-rays
Uniform thickness	Constant transmission across entire window
Epoxy adhesive (optional)	Reduced cost
Metal diffusion bond (optional)	High temperature exposure
High purity	Minimal spectral contamination

Moxtek® DuraBeryllium® windows are the highest performing beryllium x-ray windows available. DuraBeryllium windows have high x-ray transmission, are corrosion resistant, and vacuum tight. DuraBeryllium windows can be attached with a high temperature metal diffusion bond or using a vacuum compatible epoxy. DuraBeryllium windows are used in a variety of applications including microanalysis, EDXRF, WDXRF, and XRD.

DuraCoat coatings

DuraCoat and DuraCoat Plus are proprietary films that are added to beryllium to protect against potential vacuum leaks and exposure to various corrosive materials. DuraCoat is applied to both sides of a beryllium foil while DuraCoat Plus is only applied to one side. DuraCoat is available in both epoxy and metal diffusion bonded parts, while DuraCoat Plus is only available in metal diffusion bonded parts.

Window composition

DuraBeryllium windows have a proprietary inorganic DuraCoat® film which provides a hermetic seal and chemical resistance. DuraCoat refractory low-Z material is resistant to atmospheric moisture and chemicals. DuraBeryllium Plus windows have an additional DuraCoat Plus polymer film that provides maximum chemical and humidity protection with minimal impact to x-ray transmission. Uncoated beryllium windows are also available from Moxtek.

Mechanical strength

DuraBeryllium has the same mechanical strength as uncoated beryllium.

Window bonding temperature performance differences

Metal diffusion bonded windows can withstand temperatures up to 400 °C in vacuum or 350 °C in air. Epoxy bonded windows can be exposed to temperatures up to 110 °C at a differential pressure of 1atm on approved mount designs.

Cleaning

DuraBeryllium windows can be cleaned with high purity solvents (methanol, isopropanol, or ethanol are recommended). See Guidelines for Cleaning AP3 and DuraBeryllium X-ray Windows (WIN-TECH-1003). Please contact Moxtek professionals for further cleaning instruction.

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1003, Rev E

MOXTEK

DuraBeryllium® x-ray windows

Beryllium characteristics	
Hardness	2000 Vickers
Electrical Resistivity	<4x10⁴ ohm-cm

Chemical compatibility of DuraBeryllium window		
Etching reagents +	Nominal pH	Etching rates (nm/min @ 25°C)
HF	0.80	Negligible
H_2SO_4	1.38	Negligible
HNO_3	1.17	1.09
Acetic Acid	1.80	Negligible
H3PO4	1.17	0.146
Aqua Regia++	1.00	0.14
$NH_4OH+H_2O_2$	11.40	Negligible
NaOH Solution*	13.70	Negligible
Ferricyanide**	13.70	165
Permanganate#	13.70	900

DuraBeryllium windows are resistant to many solvents, acids, bases, and moisture while non-coated beryllium windows are not.

+ All solutions are concentrated unless otherwise indicated

++ Solution is 1M HNO_3, 3M HCl, 1M H_2O

* Solution is 0.5M NaOH, 0.6M H_2O_2

**Solution is 0.6M $K_3Fe(CN)_6$, 0.5M NaOH, 0.2M H_2C_2O4 (oxalic acid)

Solution is 0.6M $KMnO_4$, 0.5M KOH

DuraBeryllium window specifications	
Window leak tightness	Yes
Window light tightness	Yes
Maximum allowed leak rate	$<1x10^{-10}$ mbar • L/s
Material type and quality	Beryllium (99.9%)
Raw material vacuum integrity	Vacuum tight
Frame material	Metal
Common beryllium thickness (tolerances)	8 µm (+5/-0) 12 µm (+5/-0) 25 µm (+5/-2) 50 µm (± 10%) 125 µm (± 10%) 250 µm (± 10%)
Window open area	100%
Maximum front pressure	2 atm
Maximum back pressure	1 atm

DuraBeryllium window option comparison				
Option		Maximum operating temperature	Humidity resistance	Chemical resistance
Bonding	Epoxy	110 °C	N/A	N/A
	Metal diffusion	550 °C	N/A	N/A
Coating	None	550 °C	None	None
	DuraCoat	400 °C	Good	Good
	DuraCoat Plus	400 °C	Best	Best

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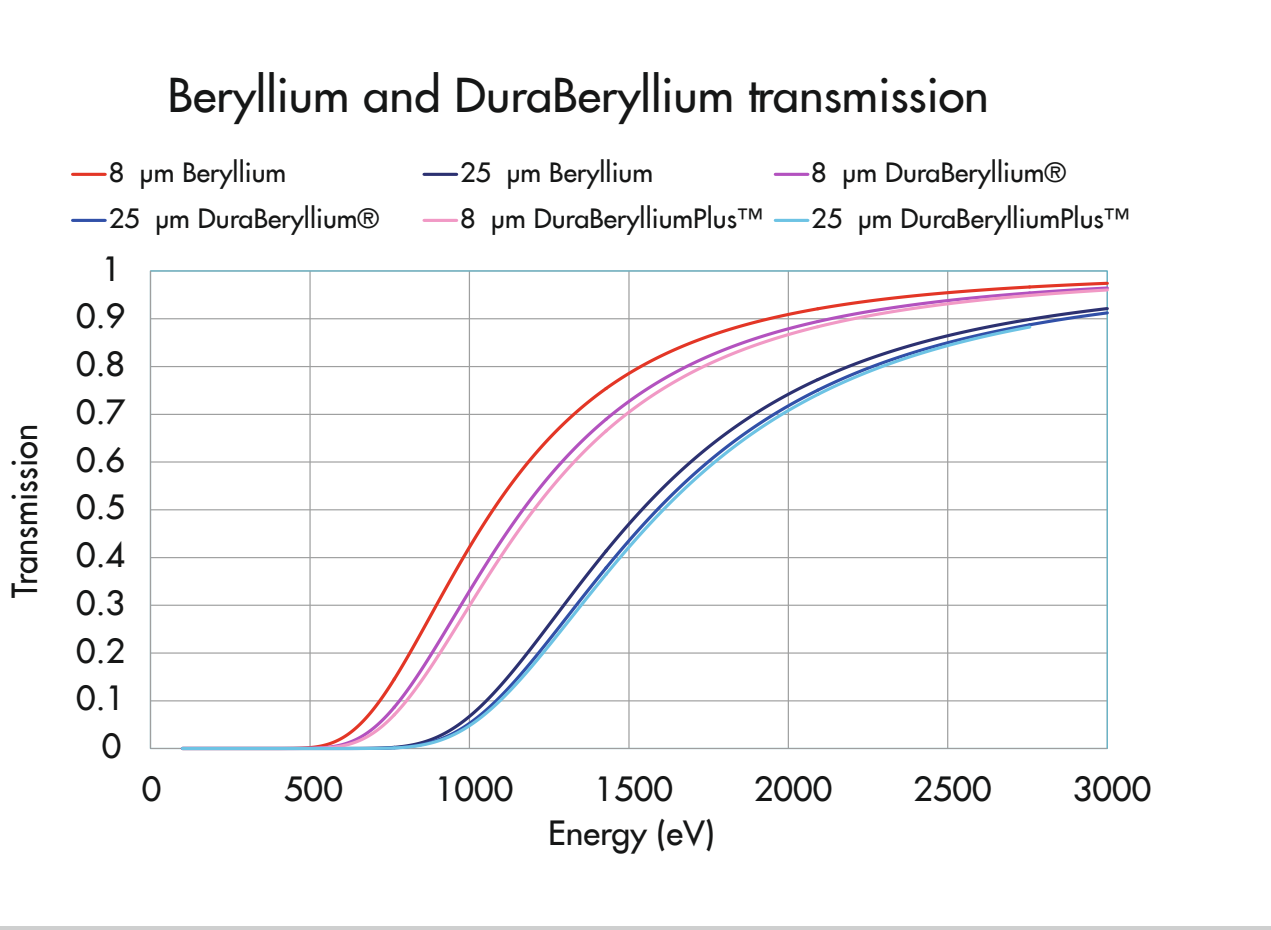
DuraBeryllium X-ray transmission

X-ray transmission of DuraBeryllium is slightly lower than bare beryllium.



Mounting

Two options are available for mounting DuraBeryllium foils: vacuum compatible epoxy adhesive or metal diffusion bonding.

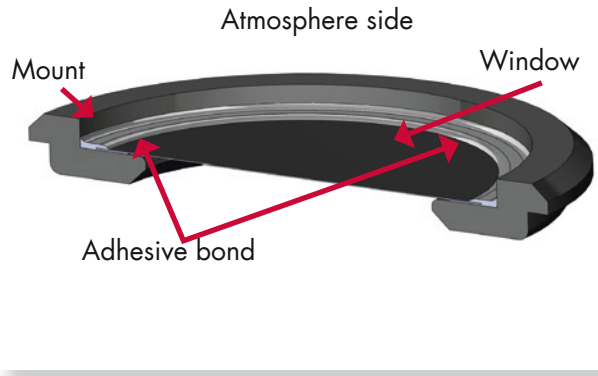


Figure 1 Epoxy adhesive attachment of Beryllium window

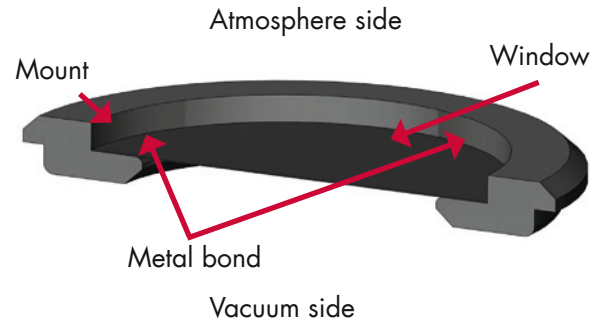


Figure 2 Epoxy metal bond attachment of Beryllium window

Note: For window mount design guidelines see Technical Note 1004, design guidelines for X-ray windows.

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