Infrared Polarizers

IR-polarizers operate in transmission and are designed to polarize IR radiation in the spectral region from 1.5 μm to MM waves. They are a sort of diffraction gratings and available on a variety of crystal and polymer substrates. The polarizer grating is made by forming grooves of a triangle profile on the substrate and subsequent deposition of a metal coating (aluminum) on one of the groove facets.

Applications

- Microscop;
- Thin film layer studies;
- Semiconductors studies;
- Electro-optic modulation systems;
- Molecular orientation studies of crystal or polymer films;
- Imaging;
- Sensors and detectors;
- Spectroscopic instruments.

Features

- Used in wavelength range from NIR to MM;
- Crystal and polymer substrates;
- Very compact with short optical path;
- High IR transmission;
- High degree of polarization;
- Polarizers are supplied in holders (protective ring with marked grid direction).

Tab. 1 Advantages of grid polarizers compared to other types of polarizers.

Grid polarizers	Wire grid substrate-free polarizers	Brewster and birefringent polarizers
Relatively low cost	Valid	Not valid
Compactness (optimal correlation between overall dimensions and clear aperture)	Not valid	Valid
Zero lateral image displacement at normal incidence	Not valid	Valid
Performance insensitive to the angle of incidence	Not valid	Valid
Possibility to use one polarizer for the wide wavelength range	Valid	Valid
High mechanical durability (for crystal polarizers)	Valid	Not valid

Sizes and shapes

Depending on the substrate material we produce polarizers using the ruled grating technique or the photolithography one.

Crystal Polarizers

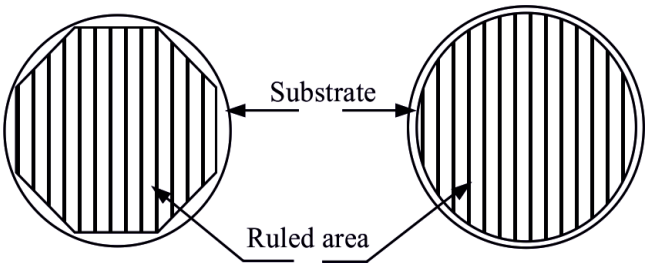
The grid is ruled onto the (normally) round substrate. After ruling the substrate is left uncut.

The shape of ruled area is shown below (polygon or round shape). These additional efforts are made to decrease the substrate size at the same clear aperture (for adjusting the polarizer into the standard setup).

Polymer polarizers

The grid is ruled onto large size material which is subsequently cut. Thus the clear aperture can be round.

The clear aperture (CA) 5mm and 25x25mm are available from stock. Alternate sizes and custom designs are available upon request. For price quotation and delivery please fax or e-mail us.



Holder sizes at the standard aperture are D42mm x T8mm or D mm x T m.

Anti- eflective (AR) oatings

Due to low refractive index of CaF2, BaF2, teflon, and polyethylene, there is no need for AR coatings for their effective operation.

However Germanium and Zinc Selenide have high refractive indices. Therefore to enhance the transmission of polarizers, we supply them Broad Band Antireflective coated over the whole transmission range.

Further enhancement of polarizer transmission is possible by optimizing the coating for specific wavelengths. The resulting transmission depends on the width of the coating spectral range (for narrower wavelength ranges, the transmission within this region is higher).

Polarizers from our stock are not AR coated. Please request your polarizers depending on their operational spectral region, to optimize the parameters for ZnSe, or Ge items.

16 Domostroitelnaya str.
194292 St. Petersburg, Russia
www.tydex.ru

Phone: 7-812-3318702
Fax: 7-812-3092958
E-mail: optics@tydex.ru

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Infrared Polarizers

Substrate material	CaF_2	BaF_2	ZnSe	Ge	Fluorineplast (teflon)		Hard polyethylene
Spectral range, μm	1-9	1.5-12	1.5-14	8-14	1,5-7	2-7	≥7
Typical operation aperture, mm	25 × 25	25 × 25	25 × 25	25 × 25	25		25
Standard holder size at typical aperture, mm	ø42 × 8	ø42 × 8	ø42 × 8	ø42 × 8	ø42 × 8 or ø34.9 × 7.9		ø42 × 8 or ø34.9 × 7.9
Maximal operation aperture, mm	50 × 50/ø 50	50 × 50/ø 50	50 × 50/ø 50	50 × 50/ø 50	80	100	100
Grooves per mm	2400	1200	1200	1200	2400	1200	1200
Transmission efficiency K1 (average)	>70%	>70%	65-70%(back side AR coated) >50%(uncoated)	>50% покр.*	75-85%	75-80%	70-80%
Transmission of unwanted radiation K2	1-2%@1.5 μm <0.5%@2 μm <0.1%@3-9 μm	1-2%@2 μm <0.1%@11μm	1-2%@2 μm <0.1%@10 μm	<0.1%@10 μm	<1%@1.5 μm <0.5% @2 μm <0.1% @3-7 μm	<2%@1.5 μm <0.1%@3 μm	<1%@8 μm <0.1%@30-1000 μm
Degree of polarization (K1-K2)/ (K1+K2)	94-97%@1.5μm >98%@2 μm >99%@3-9 μm	94-97%@2μm >99%@11μm	94-97%@ 2μm (AR coated) 92-96%@ 2μm(uncoated) >99%@ 10μm	>99%@10 μm	97%@1.5 μm >99%@2-7 μm	>97%@2 μm >99%@3-7 μm	>98%@8 μm >99.5%@30-1000 μm
Extinction ratio E=K1/(2*K2)	15-35@1.5 μm 70@2 μm 350@3-9 μm	15-35@2 μm 350@11 μm	15-35@ 2μm 325-350@ 10μm (AR coated) 10-25@ 2μm 250@ 10μm (uncoated)	>250@ 10μm(uncoated)	40-45@1.5 μm 70-85@2 μm 380-430@3-7 μm	>40@1.5 μm 380-400@3 μm	35-40@8 μm 350-400@30-1000 μm

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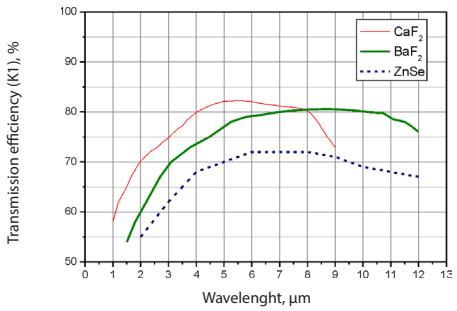
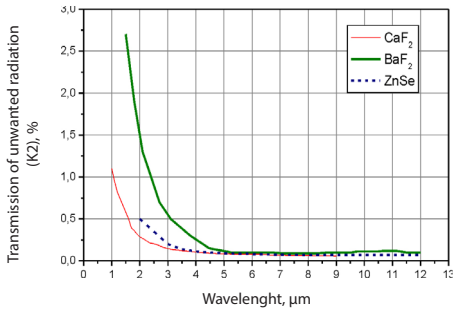
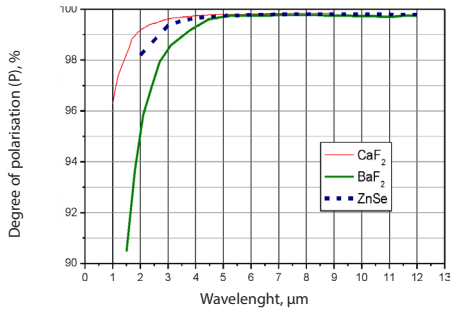
Transmission Curves

CaF_2, BaF_2 and ZnSe







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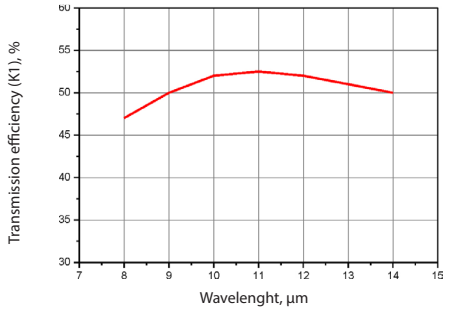

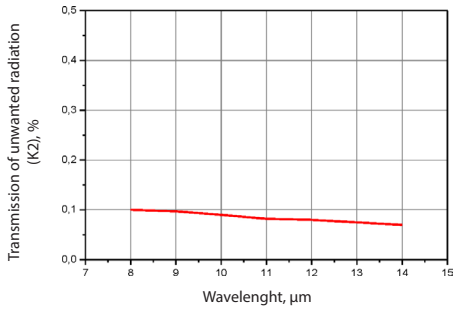

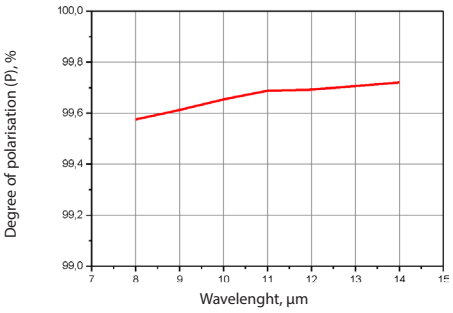

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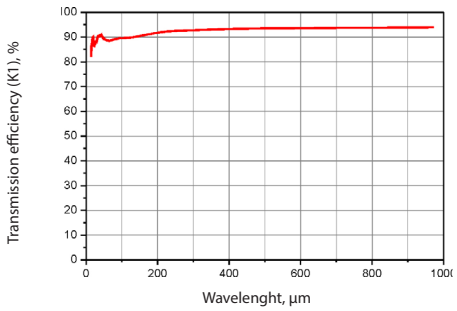
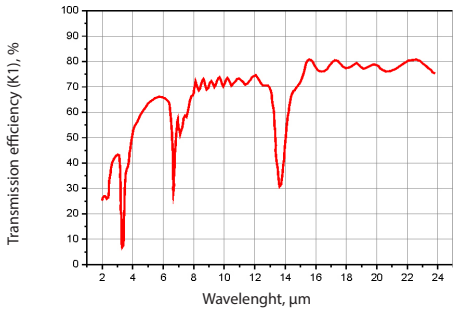
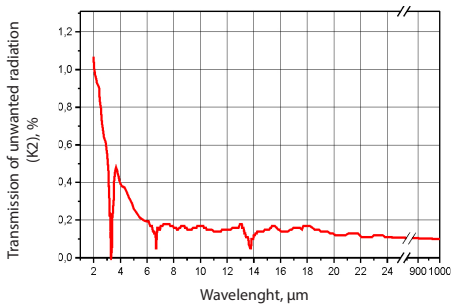
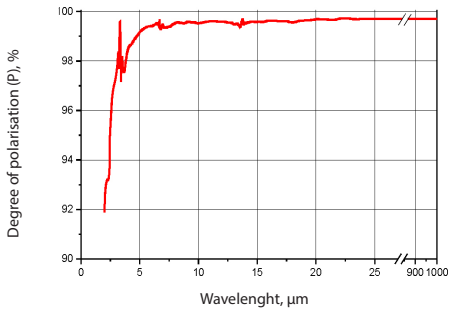
Infrared Polarizers

Polyethylene

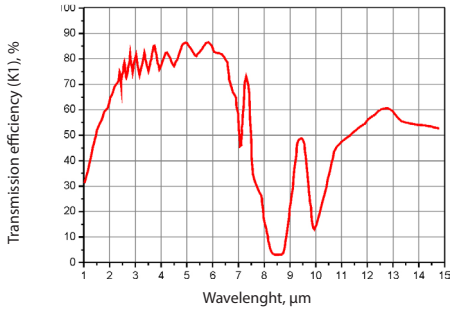


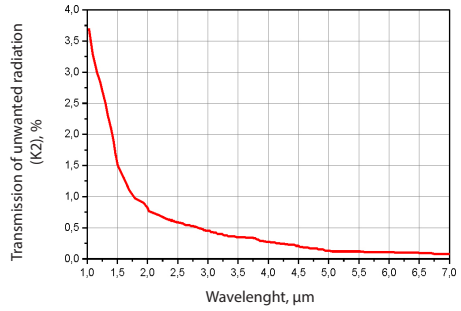


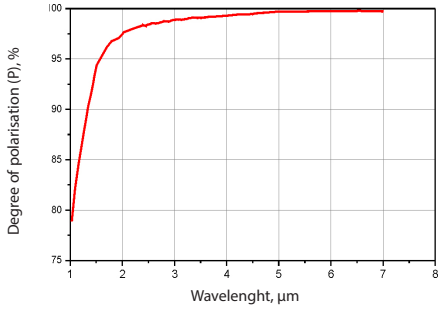




Fluorineplast (teflon)







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