



Semiconductor filters are, strictly, not thin film filters, but absorption filters, relying on the electronic band of their structure.

In an intrinsic semiconductor, the conduction band is empty and the valence band is completely full. Only a small gap separates the two bands. If an incident photon has energy greater than this gap it is able to lift an electron out of the valence band into the conduction band, and is in this way absorbed. If it has an energy less than the gap however, because the allowed levels in the valence band are completely filled, the electrons are unable to absorb it and the photon will be transmitted. This abrupt change from absorption to transmission, occurring at the wavelength corresponding to the energy gap, is known as the intrinsic edge.

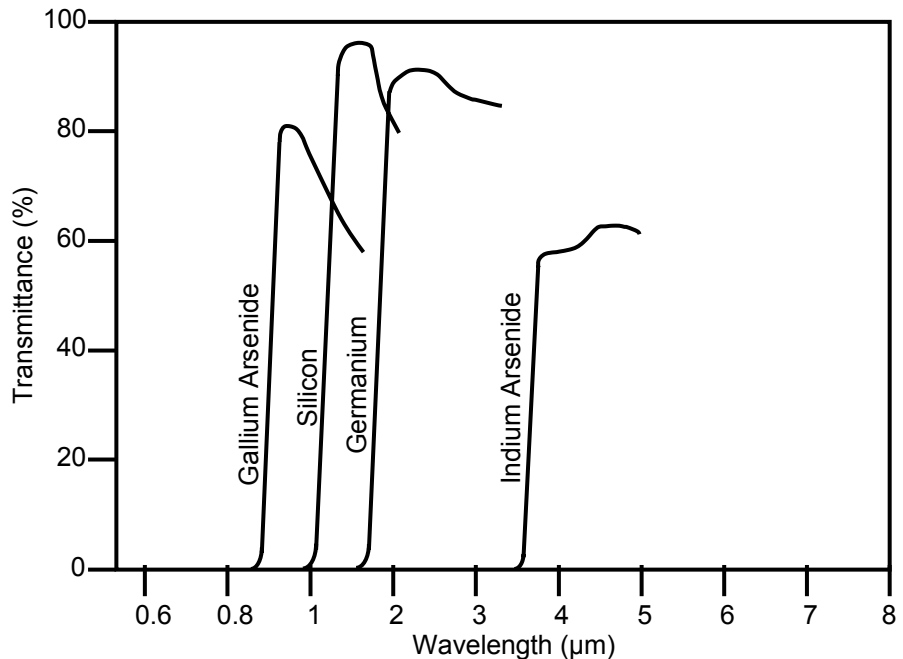
To use a semiconductor as an optical filter, two problems must be solved. Firstly, there is always some residual free carrier absorption in the pass region, and secondly, the high refractive index of semiconductors makes reflection loss at the surface rather large. The first difficulty is overcome by using a thin slice of very pure material, the second by depositing an anti-reflection coating on the surface. Semiconductor filters have long wave pass characteristics and consist of coated, optically polished discs of material, often mounted in holders for protection. Because of their very high absorption in the stop region, they are particularly useful in IR grating monochromators for the elimination of higher order spectra, which are especially troublesome when high temperature sources are used.

Email: [sales@noc-ltd.com](mailto:sales@noc-ltd.com)

Tel: +44 (0) 191 5374888

Fax: +44 (0) 191 5374777

## TYPICAL PERFORMANCE



Northumbria Optical Coatings Limited

10 Burford Way,  
Baldon Business Park,  
Baldon,  
Tyne and Wear,  
NE35 9PZ,  
United Kingdom.

Materials	5% Cut on edge position	T <sub>peak</sub> (min)	Thickness (25mmØ)	Usable aperture
Gallium Arsenide	0.90±0.04µm	80%	2.5mm	18mm
Silicon	1.05±0.04µm	90%	3.0mm	21mm
Germanium	1.70±0.05µm	90%	3.0mm	21mm
Indium Arsenide	3.60±0.14µm	70%	2.5mm	13mm



ISO 9001:2000

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