

# Package ‘photobiologyFilters’

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**Type** Package

**Title** Spectral Transmittance Data for Filters

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**Description** Spectral 'transmittance' data for frequently used filters and similar materials. Plastic sheets and films; photography filters; theatrical gels; machine-vision filters; various types of window glass; optical glass and some laboratory plastics and glassware. Part of the 'r4photobiology' suite, Aphalo P. J. (2015) <doi:10.19232/uv4pb.2015.1.14>.

**License** GPL (>= 2)

**VignetteBuilder** knitr

**Depends** R (>= 3.6.0), photobiology (>= 0.10.2)

**Suggests** knitr (>= 1.28), rmarkdown (>= 2.1), ggplot2 (>= 3.3.0), ggspectra (>= 0.3.6), photobiologyWavebands (>= 0.4.3)

**LazyLoad** no

**LazyData** yes

**ByteCompile** no

**Encoding** UTF-8

**URL** <https://docs.r4photobiology.info/photobiologyFilters/>

**BugReports** <https://bitbucket.org/aphalo/photobiologyfilters>

**RoxygenNote** 7.1.0

**NeedsCompilation** no

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photobiologyFilters-package

*photobiologyFilters: Spectral Transmittance Data for Filters*

---

### Description

Spectral 'transmittance' data for frequently used filters and similar materials. Plastic sheets and films; photography filters; theatrical gels; machine-vision filters; various types of window glass; optical glass and some laboratory plastics and glassware. Part of the 'r4photobiology' suite, Aphalo P. J. (2015) <doi:10.19232/uv4pb.2015.1.14>.

### Details

This package contains transmission spectra for different types of optical filters and filter-like objects. These spectral data are NOT normalized. In most cases they have been obtained from sheets of the standard thickness supplied by sellers. Beware that thickness has a strong effect on the wavelengths at which  $T_{fr} = 0.5$  is reached for a given material. Be also aware that some of the data are for total transmittance and some for internal transmittance. Depending on the type of filter, spectral

transmittance depends more or less strongly on the angle of incidence of radiation. All measurements included have been done with a angle of incidence that deviates at most by a 10 degrees from zero (light beam perpendicular to the surface of the filter). Additional data is provided in the documentation for different objects, and metadata is also stored as attributes in the individual spectral objects.

Transmittance data are included for:

- The whole catalogue of Schott optical filters (official data supplied by Schott for inclusion in this package).
- Most of the catalogue of MIDOPT filters (official data extracted from downloaded files from supplier, reproduced with permission).
- Clear glass as used in windows (as used by CIE, from data file downloaded from CIE's server.)
- Several types of Plexiglas from Evonik measured at our lab.
- Other types of plastic sheets supplied by Foiltek Oy and Etola Oy, measured at our lab.
- Plastic films from McDermit and Courtaulds, measured at our lab..
- Several types of theatrical 'gels' from Lee, Rosco, and Formmatt. Some measured at our lab and others data digitized from manufacturers' catalogues.
- Films used as greenhouse cladding from BPI Agri/Visqueen, XL-horticulture and generic, measured at our lab.

### Warning!

Except for those from Schott and MIDOPT, none of the spectral data included in this package are "official" specifications. In all cases data are only for information, as even suppliers refer to the data provided as typical. Spectral transmittance depends on the measurement conditions, and, even more importantly, among individual production batches of filter materials. Spectral specifications are usually given as reference values. Both glass and plastic filters also age: their spectral properties change as a result of exposure to radiation or the gases in the atmosphere. Aging is in some cases fast. Another point to keep in mind is that some filter suppliers, for example Rosco, have changed the spectral transmittance of some filters over the years without changing the code or name under which they are sold. In other words, the data provided here are not a substitute for actual measurements of transmission spectra of the filters actually used in a given piece of scientific research. For less demanding situations the data are in most cases useful, but perfect agreement with measurements on other batches of filters of the same exact type should not be expected.

### Note

This package is part of a suite of R packages for photobiological calculations described at the [r4photobiology](<https://www.r4photobiology.info>) web site.

### Author(s)

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## References

Aphalo, Pedro J. (2015) The r4photobiology suite. UV4Plants Bulletin, 2015:1, 21-29. <https://doi.org/10.19232/uv4pb.2015.1.14>.

## See Also

Useful links:

- <https://docs.r4photobiology.info/photobiologyFilters/>
- Report bugs at <https://bitbucket.org/aphalo/photobiologyfilters>

## Examples

```
library(ggspectra)
library(photobiologyWavebands)

# Total number of spectra in the package
length(filters.mspct)

# SCHOTT filters example
schott_filters
filters.mspct$Schott_0G530
filters.mspct[["Schott_0G530"]]
getWhatMeasured(filters.mspct$Schott_0G530)

# combining name (index) vectors
# blue glass filters
intersect(optical_glass_filters, blue_filters)
# green plastic films
intersect(plastic_films, green_filters)

# A Plexiglas sheet
getWhatMeasured(filters.mspct$Evonik_Sky_Blue_5C01_GT)
plot(filters.mspct$Evonik_Sky_Blue_5C01_GT)
transmittance(filters.mspct$Evonik_Sky_Blue_5C01_GT, Orange())
transmittance(filters.mspct$Evonik_Sky_Blue_5C01_GT, NIR())
```

---

acetate_filters	<i>Spectral data for filters made from different materials</i>
-----------------	--

---

**Description**

Names of datasets containing the wavelengths and tabulated values for fractional spectral transmittance according to the material they are made off.

**Usage**

acetate\_filters  
acrylic\_filters  
polycarbonate\_filters  
plexiglas\_filters  
polystyrene\_filters  
polyester\_filters  
polyvinyl\_chloride\_filters  
optical\_glass\_filters  
plastic\_film\_filters  
plastic\_films  
plastic\_sheet\_filters  
plastic\_sheets

**Format**

A vector of character strings.  
An object of class character of length 9.  
An object of class character of length 2.  
An object of class character of length 9.  
An object of class character of length 3.  
An object of class character of length 2.  
An object of class character of length 1.  
An object of class character of length 68.

An object of class character of length 31.

An object of class character of length 31.

An object of class character of length 14.

An object of class character of length 14.

### See Also

[filters.mspct](#)

### Examples

```
acrylic_filters  
  
# select filters made from acrylic  
filters.mspct[acrylic_filters]
```

---

all\_filter\_accessors *Names of different accessors*

---

### Description

The package makes available a collection of character vectors that can be used to extract spectral data for specific subsets of the filters. Some correspond to supplier names, other to materials, types, colours and typical uses. The data object described here lists the names of all these accessors, as a sort of index to this collection of data.

### Usage

```
all_filter_accessors
```

### Format

A vector of character strings.

### Examples

```
all_filter_accessors
```

---

band_pass_filters	<i>Spectral data for filters of different types</i>
-------------------	---

---

### Description

Names of datasets containing the wavelengths and tabulated values for fractional spectral transmittance according to their type or optical properties. Band-pass filters transmit a range of wavelengths, but block shorter and longer ones. Long-pass filters absorb wavelengths shorter than their cut-off and short-pass filters absorb wavelengths longer than their cut-off.

### Usage

band\_pass\_filters

long\_pass\_filters

short\_pass\_filters

### Format

A vector of character strings.

An object of class character of length 56.

An object of class character of length 17.

### Note

These vectors include only optical-glass filters with well defined characteristics.

### See Also

[filters.mspct](#)

### Examples

```
band_pass_filters  
  
# select band-pass filters  
filters.mspct[band_pass_filters]
```

---

bpi\_visqueen\_filters *Filter spectra data for commercial greenhouse films from BPI Visqueen*

---

### Description

Datasets containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for different films used as greenhouse cladding.

### Usage

```
bpi_visqueen_filters
```

### Format

A vector of character strings.

### Details

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

<https://www.rpc-bpi.com/agriculture/>

Instrument used: Shimadzu UV-2501 PC (Shimadzu Suzhou Instruments Manufacturing Co. Ltd, China) equipped with an integrating sphere.

### Note

Independent measurement of a single sample, not a specification.

### Examples

```
bpi_visqueen_filters
```



---

clear_filters	<i>Spectral data for filters of different 'colors'</i>
---------------	--

---

**Description**

Names of datasets containing the wavelengths and tabulated values for fractional spectral transmittance for filters of given colours.

**Usage**

clear\_filters

neutral\_filters

uv\_filters

blue\_filters

blue\_green\_filters

green\_filters

yellow\_filters

orange\_filters

red\_nir\_filters

heat\_filters

uvir\_cut\_filters

**Format**

A vector of character strings.

An object of class character of length 30.

An object of class character of length 44.

An object of class character of length 9.

An object of class character of length 22.

An object of class character of length 6.

An object of class character of length 14.

An object of class character of length 8.

An object of class character of length 24.

An object of class character of length 4.

An object of class character of length 7.

**See Also**

[filters.mspct](#)

**Examples**

```
clear_filters
```

```
# select filters of amber, yellow, orange color ("blue absorbing")
filters.mspct[yellow_filters]
```

---

courtaulds\_filters      *Filter spectra data for cellulose di-acetate film*

---

**Description**

Datasets containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for Courtaulds di-acetate films.

1) Films (0.115 mm thick) stretched 25 cm below lamps Q-Panel UVB313 and exposed to UV radiation from different lengths of time per day. All films were installed and sampled at the same time. The digits give the number of minutes per day that the lamps were on.

2) New films of different thicknesses.

**Usage**

```
courtaulds_filters
```

**Format**

A vector of character strings.

**Details**

For each spectrum in the collection the variables are as follows:

- w.length (nm)
- Tfr (fraction)

**Note**

Instrument used: Hewlett-Packard 8453 diode array spectrophotometer without an integrating sphere. Independent measurement of a single sample, not a specification.

**Examples**

```
courtaulds_filters
```

---

etola_filters	<i>PE films supplied by Etola Oy</i>
---------------	--------------------------------------

---

**Description**

Dataset containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for different filters supplied by Etola Oy (Finland).

**Usage**

etola\_filters

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

**Note**

Independent measurement of a single sample, not a specification.

**Examples**

etola\_filters

---

evonik_filters	<i>Total transmittance for PMMA sheets (Plexiglas) by Evonik</i>
----------------	--

---

**Description**

Total transmittance for Plexiglas sheets 3 mm thick. Data are to be used as "reference values only" as values may change in time and production batch.

**Usage**

evonik\_filters

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

Sample chips bought from the manufacturers website on 24.04.2014 <https://www.plexiglas-shop.com/>

**Note**

Data measured with an Agilent~8453 spectrophotometer (based on diode array).

Independent measurement of a single sample, not a specification.

**Examples**

```
evonik_filters
```

---

filters.mspect

*Spectral irradiance for diverse optical filters*

---

**Description**

A collection of transmittance spectra for optical filters from different suppliers.

**Usage**

```
filters.mspect
```

**Format**

A "filter\_mspect" object containing several "filter\_spct".

**Details**

The "filter\_mspect" object contains "filter\_spct" objects with spectral transmittance data.

The variables in each member spectrum are as follows:

- w.length (nm)
- Tfr (transmittance expressed as a fraction of one)

**Note**

Please see the help corresponding to each supplier for details.

**Examples**

```
filters.mspct$Schott_UG11
filters.mspct[[1]]
names(filters.mspct)
```

---

foiltek\_filters

*Spectral Transmittance for Plastic Sheets Supplied by Foiltek*

---

**Description**

Total transmittance for samples of clear plastic sheets. PC\_UV is 3 mm thick Makrolife sheet manufactured by Arlaplast Ab (Sweden). PC is generic 3 mm thick polycarbonate, PS is 3 mm thick polystyrene PET\_G is polyester approx 3 mm thick and PVC is polyvinylchloride approximately 1.5–2 mm thick all from unknown manufacturers but stock product in Foiltek's catalogue. Data are to be used as "reference values only" as values may change in time and production batch.

**Usage**

```
foiltek_filters
```

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

Sample chips supplied free of charge by Foiltek on 02.07.2014 <https://foiltek.fi/>

**Note**

Data measured with an Agilent 8453 spectrophotometer (based on diode array).

Independent measurement of a single sample, not a specification.

**Examples**

```
foiltek_filters
```

---

glass_windows	<i>Spectral transmittance for glass windows</i>
---------------	---

---

**Description**

Datasets containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for glass windows as used by CIE.

**Usage**

glass\_windows

**Format**

A vector of character strings.

**Details**

For each of the 26 spectra in the collection the variables are as follows:

- w.length (nm)
- Tfr (fraction)

**Note**

Data from file <http://files.cie.co.at/206.xls>, downloaded 2017-06-25. Abbreviated names from original .xls file used as member names. Full glass names, thickness and manufacturers names, retained and stored as metadata in attribute "what.measured".

**Examples**

glass\_windows

---

mcdermit_filters	<i>Filter spectra data for McDermit Autostat CT5 "polyester" filter</i>
------------------	---

---

**Description**

Datasets containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for filter.

**Usage**

mcdermit\_filters

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

<http://autotype.macdermid.com/>

**Note**

Instrument used: Shimadzu UV-2501 PC (Shimadzu Suzhou Instruments Manufacturing Co. Ltd, China) equipped with an integrating sphere.

**Examples**

```
mcdernit_filters
```

---

midopt_filters	<i>Total transmittance for MidOpt filters</i>
----------------	---

---

**Description**

Internal transmittance for MidOpt machine-vision optical glass, acrylic and interference filters. Data extracted from MidOpt's pdf data files with help of R package 'tabulizer'. MidOpt is a trade name of Midwest Optical Systems, Palatine, IL 60067 USA

**Usage**

```
midopt_filters
```

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

**DISCLAIMER from MidOpt**

data are typical values and may vary by plus/minus 10 nm. To interactively comparing filter spectra, please visit <https://midopt.com/tools/curve-compare/>.

**Note**

Data downloaded from <https://midopt.com/filters/> on 2017-12-26 and 2019-05-10. Republished with permission. Copyright (c) Midwest Optical Systems, Inc. (MidOpt) <https://www.midopt.com/>

**Examples**

midopt\_filters

---

petri\_dishes

*Total transmittance for Petri dishes*

---

**Description**

Total transmittance for the covers of Petri dishes. Data are to be used as "reference values only" as values may change in time and production batch.

**Usage**

petri\_dishes

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

<https://www.thermofisher.com/>

**Note**

Data measured with an Agilent 8453 spectrophotometer (based on diode array).  
Independent measurement of a single sample, not a specification.

**Examples**

petri\_dishes



---

photography\_filters    *Total transmittance for photography filters*

---

**Description**

Total transmittance for filters intended for use on camera lenses from various suppliers: Formatt Hitech, Haida, Heliopan, Hoya, Rocolax and Zomei. Data are to be used as "reference values only" as values may change in time and production batch.

**Usage**

photography\_filters  
hoya\_filters  
firecrest\_filters  
haida\_filters  
zomei\_filters  
fake\_unbranded\_filters  
baader\_filters  
uvroptics\_filters  
tiffen\_filters  
bw\_filters  
heliopan\_filters  
zeiss\_filters  
kenko\_filters  
rocolax\_filters  
kolarivision\_filters  
fotga\_filters

**Format**

A vector of character strings.  
An object of class character of length 11.

An object of class character of length 7.  
An object of class character of length 1.  
An object of class character of length 10.  
An object of class character of length 5.  
An object of class character of length 1.  
An object of class character of length 1.  
An object of class character of length 3.  
An object of class character of length 3.  
An object of class character of length 7.  
An object of class character of length 1.  
An object of class character of length 1.  
An object of class character of length 3.  
An object of class character of length 1.  
An object of class character of length 1.

### Details

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

### Supplier's web sites

<https://www.baader-planetarium.com/en/>, <https://www.formatt-hitech.com/>, <https://www.fotga.com/>, <https://www.haidaphoto.com/en/>, <http://www.heliopan.de/>, <https://hoyafilter.com/>, <https://kenkoglobal.com/>, <https://kolarivision.com/>, <https://schneiderkreuznach.com/en/photo-optics>, <https://tiffen.com/>, <https://www.uvoptics.com/>, <https://www.zomei.com/>.

### Note

Data measured with an Agilent 8453 spectrophotometer (based on diode array).

Independent measurement of a single sample, not a specification.

### Examples

photography\_filters

---

`refractive_index.mspect`*Refractive-index spectra for materials*

---

**Description**

A collection of refractive-index spectra for some materials.

**Usage**`refractive_index.mspect`**Format**

A "generic\_mspect" object containing multiple "generic\_spct" objects.

**Details**

The "generic\_mspect" object contains "generic\_spct" objects with refractive index data.

The variables in each member spectrum are as follows:

- w.length (nm)
- n
- k

**Note**

Data labeled "for unrestricted use" originate from the Filmmetrics Refractive Index Database at <https://www.filmetrics.com/refractive-index-database> where primary sources are provided. The names in `refractive_index.mspect` are the same as in the downloaded files, except for the '.txt' tag.

**Examples**

```
length(refractive_index.mspect)
names(refractive_index.mspect)
refractive_index.mspect$Acrylic
refractive_index.mspect[["Acrylic"]]
```

---

schott\_filters      *Internal transmittance for Schott filters*

---

**Description**

Internal transmittance for Schott optical glass filters. Data from manufacturer-provided excel filter tool.

**Usage**

schott\_filters

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

**DISCLAIMER from Schott**

This data collection is protected by federal copyright law and international treaty. The copyright holder retains title to and ownership of the data collection.

Data contained in this calculation tool are owned by SCHOTT, any request for permission to use them for commercial purposes must be directed to SCHOTT.

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SCHOTT reserves the right to change the optical and non-optical data without prior notice. This calculation tool renders all previous filter glass catalogs obsolete

This data collection was composed with utmost care.

**Note**

Data supplied by the manufacturer for inclusion in this package. Version 1 st June 2015. Reproduced with permission. [https://www.schott.com/advanced\\_optics](https://www.schott.com/advanced_optics)

**Examples**

schott\_filters

---

theatrical_gels	<i>Filter spectra data for theatrical filter</i>
-----------------	--

---

**Description**

Datasets containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for different filters used on light sources as spectral modifiers. Frequently called "theatrical gels".

**Usage**

theatrical\_gels

lee\_filters

lee\_gels

rosco\_filters

rosco\_gels

**Format**

A vector of character strings.

An object of class character of length 7.

An object of class character of length 7.

An object of class character of length 8.

An object of class character of length 8.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

**Note**

Instruments used: Shimadzu UV-2501 PC (Shimadzu Suzhou Instruments Manufacturing Co. Ltd, China) equipped with an integrating sphere for Rosco filters except no. 299 which was measured with an Agilent 8453 array spectrophotometer and while spectra for Lee gels have been digitized from the spectra in the Lee filters catalogue.

**References**

<https://www.leefilters.com/lighting/colour-details.html>, <https://emea.rosco.com/en/products/family/filters-and-diffusions>

**Examples**

```
theatrical_gels
```

---

```
uqg_filters
```

*Total transmittance for UQG filters*

---

**Description**

Total transmittance for UQG optical glass absorptive and interference (dichroic) filters. Data measured by P. J. Aphalo with an Agilet 8453 array spectrophotometer. Some of the filters are Schott glass and we have retained the Schott type names.

**Usage**

```
uqg_filters
```

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

**DISCLAIMER**

These spectral transmittance data are based on the measurement of a single filter of each type. Filters from other production batches may differ in their spectral properties, specially for wavelengths outside the range described in the manufacturer's published specifications. The characteristics of some types of glass filters may change with time through surface oxidation or by effect of exposure to radiation including solar radiation. The data provided is to be used only as a coarse guide. When filter properties are important the filter actually used should be measured.

**Note**

Filter supplier: UQG Ltd. The Norman Industrial Estate, Milton, Cambridge, England. <https://www.uqgoptics.com/>

**Examples**

```
uqg_filters
```

---

xl\_horticulture\_filters

*Filter spectra data for commercial greenhouse films from XL Horticulture*

---

**Description**

Datasets containing the wavelengths at a 1 nm interval and tabulated values spectral transmittance for different films used as greenhouse cladding.

**Usage**

xl\_horticulture\_filters

**Format**

A vector of character strings.

**Details**

The variables are as follows:

- w.length (nm)
- Tfr (fraction)

<https://www.xlhorticulture.co.uk/>

Instrument used: Shimadzu UV-2501 PC (Shimadzu Suzhou Instruments Manufacturing Co. Ltd, China) equipped with an integrating sphere.

**Note**

Independent measurement of a single sample, not a specification.

**Examples**

xl\_horticulture\_filters

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