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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)

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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 Courtauld, 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](<http://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:

- <http://www.r4photobiology.info/>
- 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.

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 *Spectral data for filters of different types*

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.

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)

<http://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.

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 <http://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.mspct

Spectral irradiance for diverse optical filters

Description

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

Usage

```
filters.mspct
```

Format

A "filter_mspct" object containing several "filter_spct".

Details

The "filter_mspct" 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 <http://www.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://www.macdermidautotype.com/>

Note

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

Examples

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

Examples

midopt_filters

petri_dishes	<i>Total transmittance for Petri dishes</i>
--------------	---

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
uvoptics_filters
tiffen_filters
bw_filters
heliopan_filters
zeiss_filters
kenko_filters
rocolax_filters
kolarivision_filters

Format

A vector of character strings.

Details

The variables are as follows:

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

<https://www.formatt-hitech.com/>, <https://www.haidaphoto.com/en/>, <http://www.heliopan.de/>, <https://hoyafilter.com/>, <https://www.zomei.com/>, <https://www.baader-planetarium.com/en/>, <http://www.uvoptics.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

schott_filters	<i>Internal transmittance for Schott filters</i>
----------------	--

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.

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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. http://www.schott.com/advanced_optics

Examples

schott_filters

theatrical_gels

Filter spectra data for theatrical filter

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.

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

<http://www.leefilters.com/lighting/colour-details.html>, <http://www.rosco.com/filters/index.cfm>

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 Agilent 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)

<http://www.x1horticulture.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

`x1_horticulture_filters`

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