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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. Spectral reflectance data for frequently encountered materials. Part of the 'r4photobiology' suite, Aphalo P. J. (2015) <doi:10.19232/uv4pb.2015.1.14>.

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`photobiologyFilters-package`

photobiologyFilters: Spectral Transmittance and Spectral Reflectance Data

---

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. Spectral reflectance data for frequently encountered materials. 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. Metadata is stored together with the spectral data, when available, it includes thickness, an approximate estimate of `Rfr` (contribution of reflectance) and whether attenuation by the filter is based on reflection, absorption or both. Beware that when attenuation is by absorption in the body of the filter, thickness has a strong effect on the wavelengths at which Tfr = 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. When metadata are available, estimates of spectral transmittance for different thicknesses can be approximately computed for filters based on ionic or absorptive glass or plastic. The same is true for the conversion between total and internal transmittance if `Rfr` is available. There are also filters based on surface reflection or absorptive layers on the surface or encased. Some filters even use a combination of these approaches.

Total spectral transmittance for climate screens used in agriculture and horticulture is also included.

In addition to transmittance for semitransparent materials, the package also contains data on the refractive index as a function of wavelength, for several different materials. These data allow the estimation of spectral reflectance for these materials.

Spectral reflectance data is included for several common metals and for natural and man-made surfaces (relevant to remote sensing).

Transmittance data are included for:

- The whole catalogue of Schott optical filters (official data supplied by Schott for inclussion in this package).
- Most of the catalogue of MIDOPT filters (official data extracted from dowloaded 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.
- Various filters used in UV, VIS and IR imaging and photography.

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 good agreement with measurements on other batches of filters of the same exact type should not be expected, specially for materials not intended to be used as optical filters.

Note

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

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References

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

See Also

Useful links:

- https://docs.r4photobiology.info/photobiologyFilters/
- https://github.com/aphalo/photobiologyfilters
- Report bugs at https://github.com/aphalo/photobiologyfilters/issues

Examples

```
library(ggspectra)
library(photobiologyWavebands)

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

# SCHOTT filters example
schott_filters
filters.mspct$Schott_OG530
filters.mspct[["Schott_OG530"]]
getWhatMeasured(filters.mspct$Schott_OG530)
filter_properties(filters.mspct$Schott_OG530)
cat(comment(filters.mspct$Schott_OG530))

# 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$Evonik_Sky_Blue_5C01_GT)
autoplot(filters.mspct$Evonik_Sky_Blue_5C01_GT)
transmittance(filters.mspct$Evonik_Sky_Blue_5C01_GT, Orange())
transmittance(filters.mspct$Evonik_Sky_Blue_5C01_GT, NIR())

# Asphalt
autoplot(materials.mspct$construction.asphalt, range = NIR(), w.band = NULL)
```

---

acetate_filters *Indexing of filters made from different materials*

Description

Vectors of names of member objects containing fractional spectral transmittance data for films (very flexible) and sheets (rigid or nearly rigid) grouped by the material they are made of.

Usage

```
acetate_filters

acrylic_filters

polycarbonate_filters

plexiglas_filters
```

polystyrene_filters

polyester_filters

polyvynil_chloride_filters

optical_glass_filters

plastic_film_filters

plastic_films

plastic_sheet_filters

plastic_sheets

plastic_dome_filters

plastic_domes

Format

A vector of character strings.

An object of class `character` of length 9.

An object of class `character` of length 3.

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.

An object of class `character` of length 1.

An object of class `character` of length 1.

Details

The vectors can be used to extract subsets of spectra from the collection in `filter.mspct`. Some spectra are included in more than one vector.

See Also

`filters.mspct`

Examples

```
acrylic_filters

# extract spectral data for filters made from acrylic
filters.mspct[acrylic_filters]
```

`all_filter_selectors` *Names of different indexing vectors*

Description

The package makes available character vectors that can be used to extract spectral data for specific subsets of the filters, screens, etc. Some correspond to supplier names, others to materials, types, colours and typical uses. The data objects described here list the names of all these vectors of names grouped by the collection of spectra they index.

Usage

```
all_filter_selectors

all_screen_net_selectors
```

Format

A vector of character strings.

An object of class `character` of length 7.

See Also

`filters.mspct` and `screens_nets.mspct`

Examples

```
all_screen_net_selectors
all_filter_selectors
```

`arrigoni_screens_nets` *Indexing of Climate Screens and shade nets by Supplier*

Description

Vectors of names of member objects containing spectral transmittance data for climate, shade and protection screens used in agriculture grouped by supplier. These can be used to extract subsets of spectra from the collection stored in the object named `screens_nets.mspct`, belonging to class `filter_mspct`.

Usage

```
arrigoni_screens_nets

criadolopez_screens_nets

howitec_screens_nets

huachangyarns_screens_nets

mallastextiles_screens_nets

oerlemansplastics_screens_nets

svensson_screens_nets
```

Format

A vector of character strings.

An object of class `character` of length 17.

An object of class `character` of length 40.

An object of class `character` of length 15.

An object of class `character` of length 45.

An object of class `character` of length 3.

An object of class `character` of length 32.

Acknowledgements

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References

Kotilainen, Titta; Robson, T. Matthew; Hernández, Ricardo (2018) Light quality characterization under climate screens and shade nets for controlled-environment agriculture. PLOS ONE, Vol. 13, No. 6, p. e0199628. doi:10.1371/journal.pone.0199628.

Robson, T. Matthew; Kotilainen, Titta (2018) Spectral transmittance of solar radiation by screens and nets used in horticulture and agriculture. 1.1.1. Data set. Zenodo. doi:10.5281/zenodo.1561317

Catálogo de productos. Mallastextiles, Chimalhuacán, Edo. de México. https://mallastextilesmx.com/

"Samples folder". Howitec Netting.Bolsward, The Netherlands. https://www.howitec.nl/

"Samples". Arrigoni Spa. Uggiate Trevano, Italia. https://www.arrigoni.it

"Samples". Criado & Lopez. El Ejido (Almería) España. https://www.criadoylopez.com

"Samples". oerlemans plastics BV. Genderen, The Netherlands. https://www.oerlemansplastics.nl

"samples". Jiangsu Huachang Yarns & Fabrics Co. Ltd. Jurong, Jiangsu, China. http://www.hcpco.com

Samples folder. Kinna, Sweden. https://www.ludvigsvensson.com/

See Also

screens_nets.mspct

Examples

```
arrigoni_screens_nets

# select screens supplied by Arrigoni
screens_nets.mspct[arrigoni_screens_nets[1:5]]
```

---

band_pass_filters *Indexing of filters of different curve types*

Description

Vectors of names of member objects grouped 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. Multi-band and single-band pass filters are listed together.

Usage

```
band_pass_filters

long_pass_filters

short_pass_filters
```

Format

A vector of character strings.

An object of class `character` of length 60.

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` *Indexing of greenhouse films from BPI Visqueen*

Description

Vector of names of member objects containing spectral transmittance data for different films used as greenhouse cladding supplied by BPI Visqueen.

Usage

```
bpi_visqueen_filters
```

Format

A vector of character strings.

Note

Individual measurements of single samples, not a specification. Instrument used: Shimadzu UV-2501 PC (Shimadzu Suzhou Instruments Manufacturing Co. Ltd, China) equipped with an integrating sphere. Some of these film types are no longer produced.

References

`https://www.rpc-bpi.com/sector/horticultural-solutions/` (redirected)

See Also

filters.mspct

Examples

```
bpi_visqueen_filters
```

---

clear_filters *Indexing of filters of different colors*

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 53.

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 31.

An object of class `character` of length 4.

An object of class `character` of length 9.

Details

The vectors can be used to extract subsets of spectra from the collection in `filter.mspct`. Some spectra are included in more than one vector.

See Also

`filters.mspct`

Examples

```
clear_filters

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

---

courtaulds_filters *Indexing of cellulose di-acetate films from Courtaulds*

Description

Vectors of names of member objects containing spectral transmittance data for Courtaulds di-acetate films of different thickness.

Usage

```
courtaulds_filters
```

Format

A vector of character strings.

Details

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

2) New films of different thickness.

Note

Individual measurements of single samples, not a specification. Instrument used: Hewlett-Packard 8453 diode array spectrophotometer without an integrating sphere. These films are no longer available, but similar material from other suppliers may be still available.

See Also

filters.mspct

Examples

```
courtaulds_filters
```

---

etola_filters *Indexing of PE films supplied by Etola Oy*

Description

Vectors of names of member objects containing spectral transmittance data for polythene film supplied by Etola Oy (Finland).

Usage

```
etola_filters
```

Format

A vector of character strings.

Note

Individual measurements of single samples, not a specification.

See Also

filters.mspct

Examples

```
etola_filters
```

evonik_filters *Indexing of PMMA sheets (Plexiglas) by Evonik*

Description

Vectors of names of member objects containing spectral transmittance data for Plexiglas sheets 3 mm think. 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

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).

Individual measurements of single samples, not a specification.

See Also

filters.mspct

Examples

```
evonik_filters
```

`filters.mspct` *Spectral transmittance of diverse optical filters*

Description

A collection of transmittance spectra for optical filters and similar materials from different suppliers. We include under "filters" all semi-transparent and transparent sheets and films with homogeneous optical properties. We exclude "screens" such as nets, cloths and perforated films with heterogeneous optical properties.

Usage

```
filters.mspct
```

Format

A `"filter_mspct"` object containing several `"filter_spct"`.

Details

The `"filter_mspct"` object named `filters.mspct` contains a collection of `"filter_spct"` objects with spectral transmittance data for filters and other optical sheet materials such as glass and plastic sheets and films.

The variables in each member spectrum are as follows:

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

These member objects contain metadata stored as R attributes. Accessors are available to the metadata: `what_measured()`, `how_measured()`, `when_measured()`, `filter_properties()` and `comment()`.

Note

Please see the help for the indexing vectors for specific details.

Examples

```
filters.mspct$Schott_UG11
filters.mspct[[1]]

what_measured(filters.mspct$Schott_UG11)
how_measured(filters.mspct$Schott_UG11)
filter_properties(filters.mspct$Schott_UG11)
cat(comment(filters.mspct$Schott_UG11))

names(filters.mspct)
```

`filters_UVIVIF.mspct` *Spectral fluorescence of diverse optical filters*

Description

A collection of ultraviolet-A-induced visible and near infrared fluorescence spectra for optical filters.

Usage

```
filters_UVIVIF.mspct
```

Format

A `"source_mspct"` object containing several `"source_spct"`.

Details

The `"source_mspct"` object named `filters_UVIVIF.mspct` contains a collection of `"source_spct"` objects with spectral fluorescence emission data for filters illuminated with ultraviolet-A radiation at 365 nm.

The variables in each member spectrum are as follows:

- `w.length` (nm)
- `s.q.irrad` photon irradiance (mol m-2 s-1)

These member objects contain metadata stored as R attributes. Accessors are available to the metadata: `what_measured()`, `how_measured()`, `when_measured()`, `filter_properties()` and `comment()`.

The member spectra are named consistently with the transmittance spectra in the collection `filters.mspct`. Currently all members of `filters_UVIVIF.mspct` are ionic glass photography filters.

Note

Please see the metadata for specific details. Accessors are available to the metadata: `what_measured()`, `how_measured()`, `when_measured()`, `filter_properties()` and `comment()`.

Examples

```
names(filters_UVIVIF.mspct)
filters_UVIVIF.mspct$Hoya_25A_HMC_2.3mm_52mm

what_measured(filters_UVIVIF.mspct$Hoya_25A_HMC_2.3mm_52mm)
cat(how_measured(filters_UVIVIF.mspct$Hoya_25A_HMC_2.3mm_52mm))
cat(comment(filters_UVIVIF.mspct$Hoya_25A_HMC_2.3mm_52mm))
```

`foiltek_filters` *Indexing of Plastic Sheets Supplied by Foiltek*

Description

Vector of names of member objects containing spectral transmittance data for samples of clear plastic sheets supplied by Foiltek. PC_UV is 3 mm thick Makrolife polycarbonate 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. Except for Makrolife, 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

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).

Individual measurements of single samples, not a specification.

See Also

`filters.mspct`

Examples

```
foiltek_filters
```

glass_windows *Spectral transmittance for glass windows*

Description

Indexing vector for extracting transmittance spectra for window glass panes from object `filters.mspct`.

Usage

```
glass_windows
```

Format

A vector of character strings.

Details

A character vector of names of members of the collection of spectra.

Note

The spectral data for these glasses is taken from file `https://files.cie.co.at/206.xls`, downloaded 2017-06-25. Abbreviated names from the original .xls file used as member names. Full glass names, thickness and manufacturers names, retained and stored as metadata in attribute "what.measured".

References

https://cie.co.at/

Examples

```
glass_windows
summary(filters.mspct[glass_windows])
summary(filters.mspct[glass_windows[grep("Pilkington", glass_windows)]])
```

materials.mspct *Spectral reflectance of land surfaces*

Description

Total reflectance of built, cultivated and natural land surfaces. Data are to be used as "reference values only" as actual values will vary.

Usage

```
materials.mspct
```

Format

A `reflector_mspct` object named `materials.mspct` containing a collection of `reflector_spct` objects each with 491 rows and 2 variables.

The variables for each spectrum are as follows:#'

- `w.length` (nm)
- `Rfr` (fraction)

These member objects contain metadata stored as R attributes. Accessors to the metadata are available: `what_measured()`, `how_measured()`, `when_measured()`, and `comment()`.

Note

This is a small selection from the ASTER database. See: https://speclib.jpl.nasa.gov/. Reproduced from the ECOSTRESS Spectral Library through the courtesy of the Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California. Copyright (c) 2017, California Institute of Technology. ALL RIGHTS RESERVED.

References

Meerdink, S. K., Hook, S. J., Roberts, D. A., & Abbott, E. A. (2019). The ECOSTRESS spectral library version 1.0. Remote Sensing of Environment, 230(111196), 1–8. ASTER spectral library.

Baldridge, A. M., S.J. Hook, C.I. Grove and G. Rivera, 2009.. The ASTER Spectral Library Version 2.0. Remote Sensing of Environment, vol 113, pp. 711-715.

Examples

```
materials.mspct$dry.grass
summary(materials.mspct$dry.grass)

what_measured(materials.mspct$dry.grass)
how_measured(materials.mspct$dry.grass)
cat(comment(materials.mspct$dry.grass))

names(materials.mspct)
summary(materials.mspct)
```

---

mcdermit_filters *Indexing of McDermit "polyester" films*

Description

Vector of names of member objects containing spectral transmittance data for plastic films produced by McDermit Autotype.

Usage

```
mcdermit_filters
```

Format

A vector of character strings.

Note

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

See Also

filters.mspct

Examples

```
mcdermit_filters
```

---

metals.mspct *Spectral reflectance of metals*

Description

Total reflectance of metals at 294 K (21 C), measured using an integrating sphere. Data are to be used as "reference values only" as actual values will depend on the state of the metal surface and its polish.

Usage

```
metals.mspct
```

Format

A `reflector_mspct` object named `metals.mspct` containing a collection of `reflector_spct` objects each with 47 rows and 2 variables.

The variables for each spectrum are as follows:

- `w.length` (nm)
- `Rfr` (fraction)

These member objects contain metadata stored as R attributes. Accessors to the metadata are available: `what_measured()`, `how_measured()`, `when_measured()`, and `comment()`.

Note

Data extracted from a published report by OCR.

References

Ernie W. Spisz, Albert J. Weigund, Robert L. Bowmun, and John R. Juck (1969) SOLAR ABSORPTANCES AND SPECTRAL REFLECTANCES OF 12 METALS FOR TEMPERATURES RANGING FROM 300 TO 500 K NASA TN D-5353, Technical Note, Washington DC, 22 pp. (Data from Table II (a))

Examples

```
metals.mspct$gold
summary(metals.mspct$gold)

what_measured(metals.mspct$gold)
how_measured(metals.mspct$gold)
cat(comment(metals.mspct$gold))

names(metals.mspct)
summary(metals.mspct)
```

---

midopt_filters *Indexing of MidOpt filters*

Description

Vectors of names of member objects containing spectral data 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.

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://midopt.com/

See Also

filters.mspct

Examples

```
midopt_filters
summary(filters.mspct[midopt_filters])
summary(filters.mspct[midopt_filters[grep("TB", midopt_filters)]])
```

---

petri_dishes *Indexing of Petri dishes*

Description

Vectors of names of member objects with spectral data for the covers of Petri dishes. Data are to be used as "reference values only" as values may change in time and with production batch.

Usage

```
petri_dishes
```

Format

A vector of character strings.

Note

Data measured with an Agilent 8453 spectrophotometer (based on diode array). Supplier of the plastic Petri dishes: Thermo Fisher Scientific.

Individual measurement of a single sample, not a specification.

See Also

filters.mspct

Examples

```
petri_dishes

filters.mspct[petri_dishes]
```

photography_filters *Indexing of photography filters*

Description

Vectors of names of member objects with spectral data for filters intended to be used for terrestrial- and/or astrophotography, grouped by supplier. Suppliers: Angeleyes, B+W, Baader planetarium, Formatt-Hitech (Hitech, Firecrest), Fotga, Haida, Heliopan, Hoya, Ken & Faith Concept, KinghtX, KolariVision, Nisi, Purshee, Rocolax, SVBONY, Tangsinuo, Thingyfy, Tiffen, UVRoptics, Zeiss, and Zomei.

Usage

```
photography_filters

angeleyes_filters

baader_filters

bw_filters

fake_unbranded_filters

firecrest_filters

fotga_filters

haida_filters

heliopan_filters

hoya_filters

kenfaith_filters

kenko_filters

knightx_filters

kolarivision_filters

nisi_filters

purshee_filters

rocolax_filters
```

`svbony_filters`

`tangsinuo_filters`

`tiffen_filters`

`uvroptics_filters`

`zeiss_filters`

`zomei_filters`

Format

A vector of character strings.

An object of class `character` of length 1.

An object of class `character` of length 1.

An object of class `character` of length 1.

An object of class `character` of length 2.

An object of class `character` of length 14.

An object of class `character` of length 2.

An object of class `character` of length 2.

An object of class `character` of length 10.

An object of class `character` of length 22.

An object of class `character` of length 1.

An object of class `character` of length 1.

An object of class `character` of length 4.

An object of class `character` of length 1.

An object of class `character` of length 1.

An object of class `character` of length 2.

An object of class `character` of length 3.

An object of class `character` of length 3.

An object of class `character` of length 21.

An object of class `character` of length 3.

An object of class `character` of length 1.

An object of class `character` of length 1.

An object of class `character` of length 11.

Warning!

Data are to be used as *"reference values only"* as actual transmittance may change in time and with production batch or glass melt. In some cases spectra for multiple filters of the same brand and type are included and show such variation. In other words, these spectra are measured in individual filters, other filters of the same type and brand will almost surely differ to some extent in their spectra.

The dynamic range of the data depends on the instrument used for the measurements. Most of the photography filters have been measured with an Agilent 8453 array spectrophotometer. The noise floor is at approximately 3.5 to 4.0 absorbance units within the range of wavelengths included in the data. Some small apparent "leaks" maybe only spectrometer noise. A blank and a dark measurement obtained using this instrument are also included in the data set for comparison.

The variables are as follows:

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

Supplier's web sites, if known

https://www.baader-planetarium.com/en/, https://formatt-hitech.com/ (out-of-business), https://www.fotga.com/, https://www.haidaphoto.com/en/, http://www.heliopan.de/, https://hoyafilter.com/, https://kenkoglobal.com/, https://www.kentfaith.com/, https://knightx-photography.aliexpress.com/store/924165, https://kolarivision.com/, https://purshee.aliexpress.com/store/1996249, https://schneiderkreuznach.com/en/photo-optics/b-w-filters/filtertypes, https://www.svbony.com/ https://tangsinuo.aliexpress.com/store/4314008, https://thingyfy.com/ https://tiffen.com/, https://www.uvroptics.com/ (out-of-business), https://www.zomei.com/.

Note

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

These are independent measurement each of a single sample, not a specification or typical values.

Examples

```
photography_filters
```

---

refractive_index.mspct

Refractive-index spectra for materials

Description

A collection of refractive-index spectra for some materials.

Usage

```
refractive_index.mspct
```

Format

A "generic_mspct" object containing multiple "generic_spct" objects.

Details

The "generic_mspct" 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.kla.com/products/instruments/refractive-index-database where primary sources are provided. The names in `refractive_index.mspct` are the same as in the downloaded files, except for the '.txt' tag.

Examples

```
length(refractive_index.mspct)
names(refractive_index.mspct)
refractive_index.mspct$PMMA # acrylic or Plexiglas
refractive_index.mspct[["PMMA"]]

# Compute spectral reflectance for an interface between acrylic and air
# incidence angle of colimated light 60 degrees away from the normal.
Rfr_from_n(angle_deg = 60, n = refractive_index.mspct[["PMMA"]])
```

---

schott_filters *Indexing of Schott filters*

Description

Vectors of names of member objects containing spectral dara for Schott optical glass filters. Data from manufacturer-provided excel filter tool.

Usage

```
schott_filters
```

Format

A vector of character strings.

DISCLAIMER from 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/en-gb/advanced-optics

See Also

filters.mspct

Examples

```
schott_filters
summary(filters.mspct[schott_filters])
summary(filters.mspct[schott_filters[grep("UG", schott_filters)]])
```

---

screens_nets.mspct *Spectral transmittance of plastic covers, climate screens and shade nets*

Description

A collection of transmittance spectra for plastic covers, climate screens and shade nets used in horticulture. We include under "plastic covers, climate screens and shade nets", nets, cloths and laminated and perforated films with spatially heterogeneous optical properties. We exclude "filters" including all semi-transparent and transparent sheets and films with spatially homogeneous optical properties. Spectra for nearly 200 types of covers, screens, and nets from eight suppliers were measured consistently as described by Kotilainen et al. (2018).

Usage

```
screens_nets.mspct
```

Format

A `filter_mspct` object named `screens_nets.mspct` containing a collection of `filter_spct` objects each with a variable number of rows and 2 variables.

Details

The variables for each spectrum are as follows:

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

Spectra were measured on new (never used) samples. Optical properties can be expected to change with ageing due to chemical changes induced by solar UV radiation and by soiling during the usual life expectancy of five or more years. Spectral data for twenty four climate-screen samples (ten Harmony-type, two Luxous-type, seven Solaro-type and six Tempa-type) and four insect-screen samples provided by Svensson (AB Ludvig Svensson, KINNA, Sweden, https://www.ludvigsvensson.com/en/climate-screens). Twenty-six shade-net samples (16 Sombra-type and ten Sombra raschel-type (patterned)) and 12 thrip, aphid, and insect -net samples (two Anti-Trip-type, eight Anti-Afidos-type and two Anti-Insect types) were provided by Mallas Textiles (Mallas Textiles Fabricantes, Chimalhuacán, Mexico, `https://mallastextilesmx.com/`) were described by Kotilainen et al. (2018). Additional spectra obtained by the same authors are also included in this package. If you use these data in publications, please, cite both Kotilainen et al. (2018) and this package.

The variables in each member spectrum are as follows:

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

These member objects contain metadata stored as R attributes. Accessors to the metadata are available: `what_measured()`, `how_measured()`, `when_measured()`, `filter_properties()` and `comment()`.

Acknowledgements

These data were acquired as part of research funded by the Academy of Finland (Decision No. 304653 and 304519 to T. M. Robson) and USDA National Institute of Food and Agriculture (Decision No. 107454 to R. Hernández).

Note

Please see the help for the indexing vectors for specific details. The original data of Kotilainen et al. (2018) plus additional spectral data are available at Zenodo (Robson and Kotilainen, 2018). The data read from file `ScreensNets_irrad_trans.xlsx`, worksheet `"database"`, have been reprocessed to remove noise. The wavelength values have been "thinned" in featureless regions using as criterion the lack of change in the local slope to significantly reduce the size of the data set. Lossless compression was applied to the R data file containing the data set.

References

Kotilainen, Titta; Robson, T. Matthew; Hernández, Ricardo (2018) Light quality characterization under climate screens and shade nets for controlled-environment agriculture. PLOS ONE, Vol. 13, No. 6, p. e0199628. doi:10.1371/journal.pone.0199628.

Robson, T. Matthew; Kotilainen, Titta (2018) Spectral transmittance of solar radiation by screens and nets used in horticulture and agriculture. 1.1.1. Data set. Zenodo. doi:10.5281/zenodo.1561317

Catálogo de productos. Mallastextiles, Chimalhuacán, Edo. de México. https://mallastextilesmx.com/

"Samples folder". Howitec Netting.Bolsward, The Netherlands. https://www.howitec.nl/

"Samples". Arrigoni Spa. Uggiate Trevano, Italia. https://www.arrigoni.it

"Samples". Criado & Lopez. El Ejido (Almería) España. https://www.criadoylopez.com

"Samples". oerlemans plastics BV. Genderen, The Netherlands. https://www.oerlemansplastics.nl

"samples". Jiangsu Huachang Yarns & Fabrics Co. Ltd. Jurong, Jiangsu, China. http://www.hcpco.com

Samples folder. Kinna, Sweden. https://www.ludvigsvensson.com/

See Also

screens_nets_suppliers

Examples

```
screens_nets.mspct$arrigoni_X2210WO.Iride.Black.Green

what_measured(screens_nets.mspct$arrigoni_X2210WO.Iride.Black.Green)
how_measured(screens_nets.mspct$arrigoni_X2210WO.Iride.Black.Green)
filter_properties(screens_nets.mspct$arrigoni_X2210WO.Iride.Black.Green)
cat(comment(screens_nets.mspct$arrigoni_X2210WO.Iride.Black.Green))

names(screens_nets.mspct)
```

---

stacked_filters *Spectral transmittance for filter stacks*

Description

Indexing vector for selecting transmittance spectra for stacks of two or more filters.

Usage

```
stacked_filters
```

Format

A vector of character strings.

Details

A character vector of names of spectra in object `filter.mspct` measured by P. J. Aphalo from stacks of filters. Unless differently indicated in the spectrum metadata, the filters in the stack were separated by an air gap. Because of multiple reflections at the air-glass interfaces the measured spectra differ slightly from the result of a simple convolution between the spectra corresponding to the individual filters.

See Also

`filters.mspct`

Examples

```
stacked_filters

filters.mspct[stacked_filters]
```

---

theatrical_gels *Indexing of theatrical "gels"*

Description

Vectors of names of member objects with spectral transmittance for different filters used on light sources in theatres, photo and video studios 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.

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. Spectra for Lee gels have been digitized from the spectral plots in the Lee filters catalogue.

References

https://leefilters.com/lighting/colour-effect-lighting-filters/, https://emea.rosco.com/en/products/family/filters-and-diffusions

See Also

filters.mspct

Examples

```
theatrical_gels
```

---

thorlabs_filters *Indexing of Thorlabs filters*

Description

Vectors of names of member objects containing spectral data for Thorlab Hard-Coated UV/VIS Bandpass Filters. This is only selected sample from the on-line catalogue and covers only band-pass interference filters of the highest quality. Absorbing ionic glass filters from Thorlabs are mostly Schott glass, avaialable under schott_filters.

Usage

```
thorlabs_filters
```

Format

A vector of character strings.

DISCLAIMER from Thorlabs

The data presented here are typical. Slight variations in performance data will occur from lot to lot. Please contact Technical Support with any questions regarding the use or reliability of this data.

On REUSE from Thorlabs

This data may be used in publications. However, please cite Thorlabs as the source.

Note

Data downloaded from https://www.thorlabs.de/ on 2025-10-25. Thorlabs GmbH, Bergkirchen, Germany. Thorlabs Inc. Newton, New Jersey, United States of America.

See Also

filters.mspct

Examples

```
thorlabs_filters
summary(filters.mspct[thorlabs_filters])
summary(filters.mspct[thorlabs_filters[grep("-40$", thorlabs_filters)]])
```

---

uqg_filters *Indexing of UQG filters*

Description

Vectors of names of member objects containing spectral data for 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.

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/

See Also

filters.mspct

Examples

```
uqg_filters
```

`water_n` *Refractive index of water*

Description

The refractive index, usually abbreviated as n varies with temperature and wavelength.

Usage

```
water_n(temperature = 20, w.length = 540, type = "freshwater")
```

Arguments

`temperature`	numeric Water temperature in degrees Celcius (C)
`w.length`	numeric Wavelength in nanometres (nm)
`type`	character One of "freshwater" or "seawater".

Details

Function 'n.water()' implements the function proposed by Parrish for approximation of n for freshwater and seawater. The function is valid for wavelengths from 400 nm to 700 nm, and for temperatures from 0 C to 30 C. The function is vectorized.

References

Chris Parrish (2020) Index of Refraction of Seawater and Freshwater as a Function of Wavelength and Temperature. https://research.engr.oregonstate.edu/parrish/index-refraction-seawater-and-freshwat

See Also

For other materials see `refractive_index.mspct` and to compute reflectance from n see `Rfr_from_n`.

Examples

```
water_n(w.length = (40:70)*10)
water_n(temperature = seq(0, 30, by = 5))
```

`xl_horticulture_filters` *Filter spectra data for commercial grenhouse 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) equiped with an integrating sphere.

Note

Idependent measurement of a single sample, not a specification.

Examples

```
xl_horticulture_filters
```

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