Package ‘photobiologyFilters’

October 5, 2020

Type Package
Title Spectral Transmittance and Spectral Reflectance Data
Version 0.5.2
Date 2020-10-04
Maintainer Pedro J. Aphalo <pedro.aphalo@helsinki.fi>
License GPL (>= 2)
VignetteBuilder knitr
Depends R (>= 3.6.0), photobiology (>= 0.10.4)
Suggests knitr (>= 1.30), rmarkdown (>= 2.3), ggplot2 (>= 3.3.2), ggspectra (>= 0.3.6), photobiologyWavebands (>= 0.4.4)
LazyLoad no
LazyData yes
ByteCompile no
Encoding UTF-8
URL https://docs.r4photobiology.info/photobiologyFilters/
BugReports https://bitbucket.org/aphalo/photobiologyfilters
RoxygenNote 7.1.1
NeedsCompilation no
Author Pedro J. Aphalo [aut, cre] (<https://orcid.org/0000-0003-3385-972X>), Titta K. Kotilainen [ctb] (Contributed data), Tania de la Rosa [ctb] (Contributed data), Riitta Tegelberg [ctb] (Contributed data), Andreas Albert [ctb] (Contributed data), SCHOTT AG [ctb] (Contributed data), Midwest Optical Systems, Inc. (MidOpt) [ctb] (Contributed data)
R topics documented:

photobiologyFilters-package .................................................. 2
acetate_filters ................................................................. 5
all_filter_accessors ........................................................... 6
band_pass_filters .............................................................. 7
bpi_visqueen_filters ........................................................... 8
clear_filters ................................................................. 9
courtaulds_filters .............................................................. 10
etola_filters ................................................................. 11
evonik_filters ................................................................. 11
filters.mspct ................................................................. 12
foiltek_filters ................................................................. 13
glass_windows ................................................................. 14
materials.mspct ............................................................... 14
mcdermit_filters ............................................................... 15
metals.mspct ................................................................. 16
midopt_filters ................................................................. 17
petri_dishes ................................................................. 18
photography_filters ........................................................... 19
refractive_index.mspct ......................................................... 21
schott_filters ................................................................. 22
theatrical_gels ................................................................. 23
uqg_filters ................................................................. 24
xl_horticultureFilters ......................................................... 25

Index .............................................................................. 26

PhotobiologyFilters-package

PhotobiologyFilters: Spectral Transmittance and Spectral Reflectance Data

Description

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 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 usually computed. The same is true for the conversion between total and internal transmittance.

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 some 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 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 McDermitt and Courtaulds, measured at our lab.
- Several types of theatrical ’gels’ from Lee, Rosco, and Formatt. 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 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)

Maintainer: Pedro J. Aphalo <pedro.aphalo@helsinki.fi> (ORCID)

Other contributors:

- Titta K. Kotilainen <titta.kotilainen@helsinki.fi> (Contributed data) [contributor]
- Tania de la Rosa <tania.delarosa@niras.fi> (Contributed data) [contributor]
- Riitta Tegelberg <riitta.tegelberg@uef.fi> (Contributed data) [contributor]
- Andreas Albert (Contributed data) [contributor]
- SCHOTT AG (Contributed data) [contributor]
- Midwest Optical Systems, Inc. (MidOpt) (Contributed data) [contributor]

References


See Also

Useful links:

- [https://docs.r4photobiology.info/photobiologyFilters/](https://docs.r4photobiology.info/photobiologyFilters/)
- Report bugs at [https://bitbucket.org/aphalo/photobiologyfilters](https://bitbucket.org/aphalo/photobiologyfilters)

Examples

```r
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)
```
acetate_filters

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

Usage

acetate_filters
crylic_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

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 acessors, as a sort of index to this collection of data.
band_pass_filters

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.
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/sector/horticultural-solutions/

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
Spectral data for 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 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]
etola_filters

**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

**Description**

Total transmittance for PMMA sheets (Plexiglas) by Evonik

**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.mspct  Spectral irradiance for diverse optical filters

Description

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

Usage

datafilters

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

```r
data(filters.mspct)
head(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

```r
goethe_data
```

#### 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/](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

```r
goethe_data
```
glass_windows  
*Spectral transmittance for glass windows*

**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](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

materials.mspct  
*Total reflectance of materials*

**Description**
Total reflectance of materials. Data are to be used as "reference values only" as actual values will vary.

**Usage**
materials.mspct
mcdermit_filters

Format

A reflector_mspct object containing a collection of reflector_spect each with 491 rows and 2 variables.

Details

The variables for each spectrum are as follows:

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

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


Examples

library(ggspectra)

names(materials.mspct)
cat(comment(materials.mspct$black.loam))
autoplot(materials.mspct$black.loam, annotations = c("+", "title:what"),
  range = c(NA, 800))

mcdermit_filters

Filter spectra data for McDermit Autostat CT5 "polyester" filter

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

mcdermit_filters

metals.mspct

Total reflectance of metals at 294 K

Description

Total reflectance of metals at 294 K, 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 containing a collection of reflector_spct each with 47 rows and 2 variables.

Details

The variables for each spectrum are as follows:

• w.length (nm)
• Rfr (fraction)

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

```r
library(ggspectra)

names(metals.mspct)
cat(comment(metals.mspct$gold))
autoplot(metals.mspct$gold, annotations = c("+", "title:what"))
```

midopt_filters

<table>
<thead>
<tr>
<th>midopt_filters</th>
<th>Total transmittance for MidOpt filters</th>
</tr>
</thead>
</table>

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

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)

Note
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.
Details

The variables are as follows:

- \textit{w.length} (nm)
- \textit{Tfr} (fraction)

Supplier’s web sites


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 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 Filmetrics Refractive Index Database at https://www.filmetrics.com/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

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

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

SCHOTT makes no warranty of representation, either expressed or implied, with respect to this data including their quality, merchantability, or fitness for a particular purpose.

In no event will SCHOTT be liable for direct, indirect, special, incidental, or consequential damages arising out of the use or inability to use the calculation tool even if SCHOTT has been advised of the possibility of such damages.

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


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.
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**

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**


**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/](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`
Index

* datasets
  acetate_filters, 5
  all_filter_accessors, 6
  band_pass_filters, 7
  bpi_visqueen_filters, 8
  clear_filters, 9
  courtaulds_filters, 10
  etola_filters, 11
  evonik_filters, 11
  filters.mspct, 12
  foiltek_filters, 13
  glass_windows, 14
  materials.mspct, 14
  mcdermit_filters, 15
  metals.mspct, 16
  midopt_filters, 17
  petri_dishes, 18
  photography_filters, 19
  refractive_index.mspct, 21
  schott_filters, 22
  theatrical_gels, 23
  ugg_filters, 24
  xl_horticulture_filters, 25
  'filter (band_pass_filters), 7
  acetate_filters, 5
  acrylic_filters (acetate_filters), 5
  all_filter_accessors, 6
  baader_filters (photography_filters), 19
  band_pass_filters, 7
  blue_filters (clear_filters), 9
  blue_green_filters (clear_filters), 9
  bpi_visqueen_filters, 8
  bw_filters (photography_filters), 19
  clear_filters, 9
  colors (clear_filters), 9
  courtaulds_filters, 10
  etola_filters, 11
  evonik_filters, 11
  fake_unbranded_filters
    (photography_filters), 19
  filters.mspct, 6, 7, 10, 12
  firecrest_filters
    (photography_filters), 19
  foiltek_filters, 13
  fotga_filters (photography_filters), 19
  glass_windows, 14
  green_filters (clear_filters), 9
  haida_filters (photography_filters), 19
  heat_filters (clear_filters), 9
  heliopan_filters (photography_filters), 19
  hoya_filters (photography_filters), 19
  kenko_filters (photography_filters), 19
  kolarivision_filters
    (photography_filters), 19
  lee_filters (theatrical_gels), 23
  lee_gels (theatrical_gels), 23
  long_pass_filters (band_pass_filters), 7
  materials (acetate_filters), 5
  materials.mspct, 14
  mcdermit_filters, 15
  metals.mspct, 16
  midopt_filters, 17
  neutral_filters (clear_filters), 9
  optical_glass_filters
    (acetate_filters), 5
  orange_filters (clear_filters), 9
  petri_dishes, 18
photobiologyFilters
  (photobiologyFilters-package), 2
photobiologyFilters-package, 2
photography_filters, 19
plastic_film_filters (acetate_filters), 5
plastic_films (acetate_filters), 5
plastic_sheet_filters
  (acetate_filters), 5
plastic_sheets (acetate_filters), 5
plexiglas_filters (acetate_filters), 5
polycarbonate_filters
  (acetate_filters), 5
polyester_filters (acetate_filters), 5
polystyrene_filters (acetate_filters), 5
polyvynil_chloride_filters
  (acetate_filters), 5
red_nir_filters (clear_filters), 9
refractive_index.mspct, 21
rocolax_filters (photography_filters), 19
roscoFilters (theatrical_gels), 23
rosco_gels (theatrical_gels), 23
schott_filters, 22
short_pass_filters (band_pass_filters), 7
theatrical_gels, 23
tiffen_filters (photography_filters), 19
types' (band_pass_filters), 7
uqg_filters, 24
uv_filters (clear_filters), 9
uvir_cut_filters (clear_filters), 9
uvroptics_filters
  (photography_filters), 19
xl_horticulture_filters, 25
yellow_filters (clear_filters), 9
zeiss_filters (photography_filters), 19
zomei_filters (photography_filters), 19