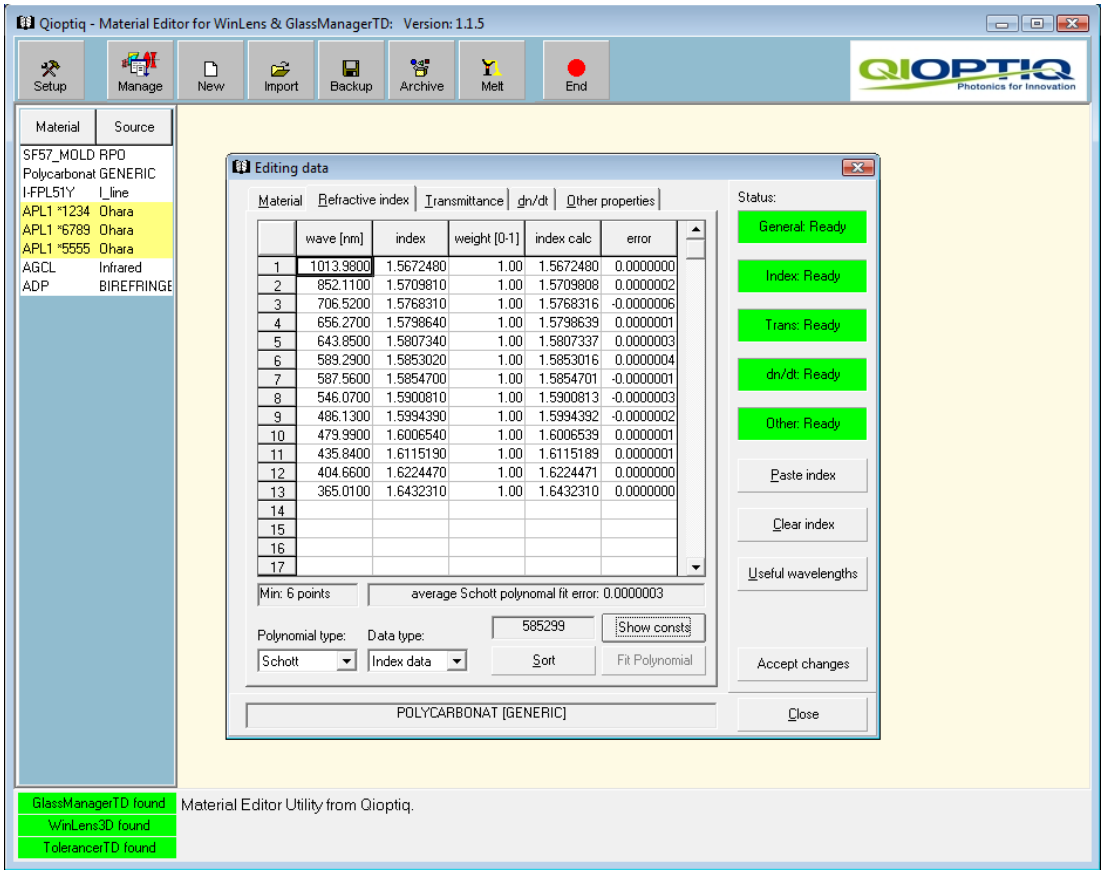
Material Editor

Optical Design Software

create and manage materials for WinLens Suite



A product of

Qioptiq Photonics GmbH & Co Kg
Königsallee 23
D - 37081 Göttingen
Germany

www.qioptiq.com
Qioptiq website

www.winlens.de
Software updates

www.opticalsoftware.net
Support videos & news

Summary

Material Editor is a utility that is part of the WinLens Suite.

Its single purpose is to allow a user to create and manage optical materials for the glass datafiles in the WinLens suite.

Materials can be created in one of three ways
- Manually from raw data
- Melt derivative of an existing glass
- Import from a text file [specific formats only]

Material Editor has seven main functions, each served by a dedicated form. This manual provides an overview of the program and then discusses the functions in detail, showing useful tips along the way.

Copyright © 2018 Qioptiq Photonics. All rights reserved.

The software

The software described in this manual is furnished under a license agreement and may be used or copied only in accordance with the terms of the agreement.

NO WARRANTIES. Qioptiq Photonics expressly disclaims any warranty for the SOFTWARE PRODUCT. THE SOFTWARE PRODUCT AND ANY RELATED DOCUMENTATION IS PROVIDED "AS IS" WITHOUT WARRANTY OR CONDITION OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. THE ENTIRE RISK ARISING OUT OF USE OR PERFORMANCE OF THE SOFTWARE PRODUCT REMAINS WITH YOU.

LIMITATION OF LIABILITY. In no event shall Qioptiq Photonics or its suppliers be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use the SOFTWARE PRODUCT, even if Qioptiq Photonics or its suppliers has been advised of the possibility of such damages.

The manual

All rights reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means: electronic, mechanical, photocopying, recording or otherwise, without permission in writing from the publishers.

Revision 1.1.8

Author: Dr Geoff Adams

Contents

1. INTRODUCTION 4

1.1 INSTALLATION 5

1.1.1 SYSTEM REQUIREMENTS 5

1.1.2 INSTALLATION PROCESS 5

1.1.3 LICENSE FILE 5

1.2 OVERVIEW 6

2. 'SETUP' FORM 7

3. 'MANAGE' FORM 8

3.1 CHANGING CUSTOM MATERIALS LOCALLY 8

3.2 MANAGING CUSTOM MATERIALS IN EXTERNAL PROGRAMS 8

4. 'NEW/EDIT' FORM 9

4.1 MATERIAL DESCRIPTOR 10

4.2 REFRACTIVE INDEX 10

4.3 TRANSMITTANCE 11

4.4 DNDT 12

4.5 OTHER PROPERTIES 13

4.6 EDITING MODE 13

5. 'IMPORT' FORM 14

6. 'BACKUP' FORM 15

7. 'ARCHIVE' FORM 16

8. 'MELT' FORM 17

8.1 SCHOTT MELT DATA 18

9. SIDEBAR 19

10. QIOPTIQ LICENSE AGREEMENT 20

1. Introduction

Optical glass & crystals are the raw material of any lens. Data on such materials is therefore essential to any optical design program worth its name.

Data from the main glass manufacturers [CDGM [Chengdu], Corning[1], Hikari, Hoya, Ohara, Pilkington[2], Schott & Sumita are provided with the suite. This data is the latest we have available - where possible we check it for consistency - for example in the dispersion coefficients.

For your optical designs this may not be sufficient. Material Editor exists to allow you to setup and manage extra materials for use within WinLens3D and Glass Manager.

You can create materials:

- From scratch - providing all the data
- As melt materials - using an existing catalogue glass. You merely have to provide some extra refractive index data.
- By import from third party files

This utility is much simpler than the main programs. The interface consists of a toolbar with 8 buttons and one sidebar. Each button loads a form which is dedicated to one purpose.

This manual follows thru the main toolbar items - working left to right - dedicating a chapter to each form.

Function	Chapter
Setup: paths to the programs in the suite	Ch 2
Manage: export glass data to Winlens suite - various options	Ch 3
New: create a new material from nothing	Ch 4
Import: open glass data files from various sources	Ch 5
Backup: prepare backup files of some/all of your glass data	Ch 6
Archive: move unused glasses in the Glass Manager database to an archive table	Ch 7
Melt: prepare a melt glass - based upon an existing catalogue material. All you have to do is supply	Ch 8

The manual ends with a brief look at the side bar.

[1] Corning now only produces their materials on request

[2] Pilkington no longer manufacturers optical glasses. Their materials, now all obsolete, are included for the sake of users who have designs with their glasses. Don't forget GlassManager makes it easy to find equivalents for obsoletes.

1.1 Installation

The Material Editor utility is very easy to install and run, provided of course that your machine has the necessary capabilities.

You should install WinLens3D, Tolerancer and Glass Manager first - as Material Editor will try to find them on first starting up.

1.1.1 System Requirements

Material Editorwill run on PC's with Win XP, 7 or Vista. It will probably run on earlier operating systems too.

Any machine capable of running one of the named operating systems without problem should also run Glass Manager without problem.

1.1.2 Installation process

You will have either downloaded the installation zip file from www.winlens.de or been sent a CD with it.

Inside the zip file, you will find an executable
MaterialEditorTD_Installer.exe

Extract this executable onto your PC, and double click to start the installation process.

By default Material Editor will be installed in folder:
C:\Program Files\Qioptiq\MaterialEditorTD
You can change this if so desired.

The installation process is very straightforward - there are no further options.

1.1.3 License file

Once Material Editor is installed, you must then place a copy of the encrypted license file, LINOS_3D.LIC in the same folder as the program.

This license file is specific to you and will be send upon purchase of a license file for the WinLens suite.

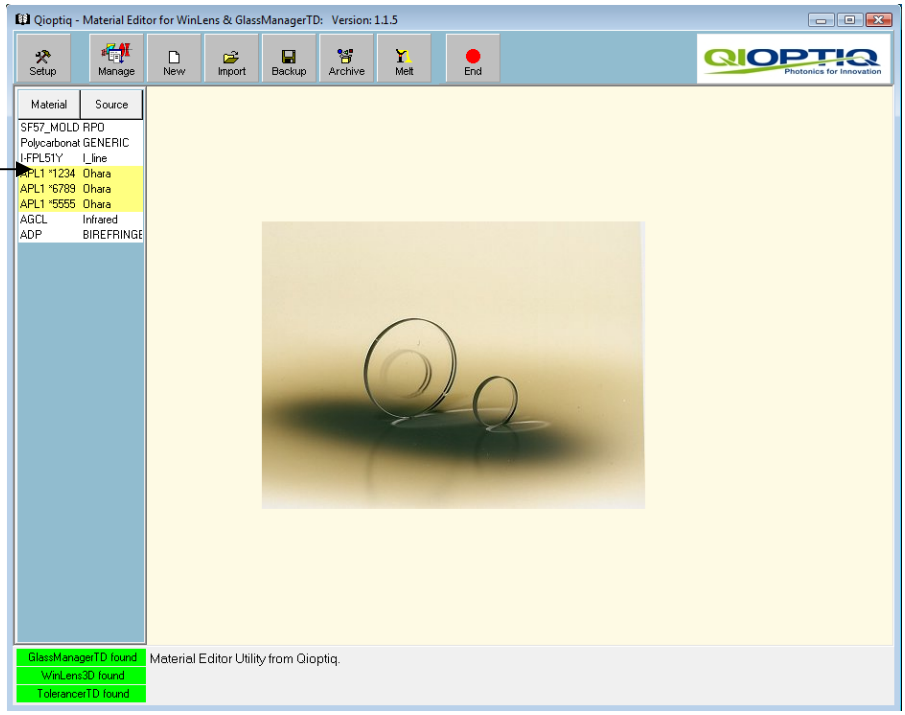
If you do not do this Material Editor will refuse to start!

1.2 Overview

Material Editor is designed to make it as easy as possible for you to create data for new glasses for use by other members of the WinLens3D suite.

This data may be entered manually or as a melt derivative of an existing glass or by import from a third party file.

Once the data is verified it is stored in a local datafile, along with the data for all other glasses you have created.



Your new glasses are listed in the side bar, from where you may edit[3] them, if you wish to make changes at any time. Alternatively you may duplicate a glass, rename it and then edit the duplicate.

You can then export this data to WinLens3D and WinLensTolerancer and/or GlassManager, where it can be used exactly as any other glass in the relevant databases.

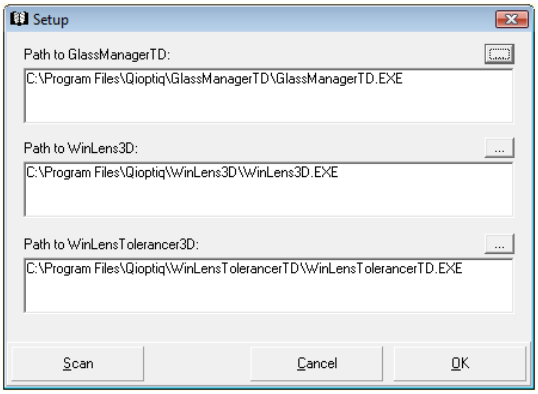
You may create text file [.GLZ] backups of individual or all glasses. These GLZ files can be sent to other users to ensure that they have the same data.

The program has several functions. Each function has its own form. Only one form will be visible at any time, and is loaded by clicking the appropriate button in the header-bar of the main form. As noted before, each form is discussed in a separate chapter

[3] Edit glasses in the list via a right click on the glass name of interest

2. 'Setup' form

This is a very simple form whose sole purpose is to display the paths to the other programs in the Winlens3D suite.



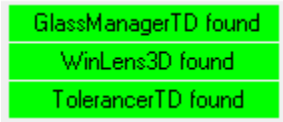
These are needed for when MatEd is used to update material data in the main programs.

On first installing MatEd an automatic scan is run to find the paths - therefore it is good to install the othr programs first!

Assuming that the programs are present, these will be shown in the three text areas on the form.

If for some reason the path is wrong, then you can request a scan [re-scan] via button at bottom right, or manually set the paths via the buttons at the right of each path.

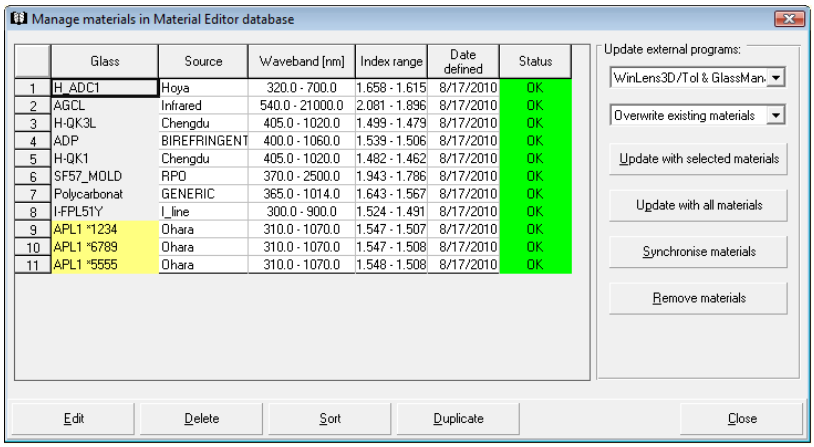
When the paths are correct press the OK button. The form will disapear - and the panel at lower right of the main form will be all green..



3. 'Manage' form

The 'Manage' form allows you to:

- view a list of the custom materials in MatEd's local database
- change the materials in some way
- export materials to WinLens3D/Tolerancer and/or Glass Manager
- remove materials from WinLens3D/Tolerancer and/or Glass Manager



The spreadsheet obviously contains a list of the custom materials you have created/imported into Material Editor.

3.1 Changing custom materials locally

[Buttons along bottom of form]

- **Edit** - displays data for the current glass in the form described in chapter 4 - you can then make changes and save the updated material data.
- **Delete**. Cut one or more selected glasses from the spreadsheet. You will be presented with a popup checkbox-dialog of custom materials in the external programs. Check the unwanted glasses and press the 'remove' button in the dialog.
- **Sort**. define the order of the materials in the list [name or maker]
- **Duplicate**. Make a copy of an existing custom glass, but forces you to change its name.

3.2 Managing custom materials in external programs

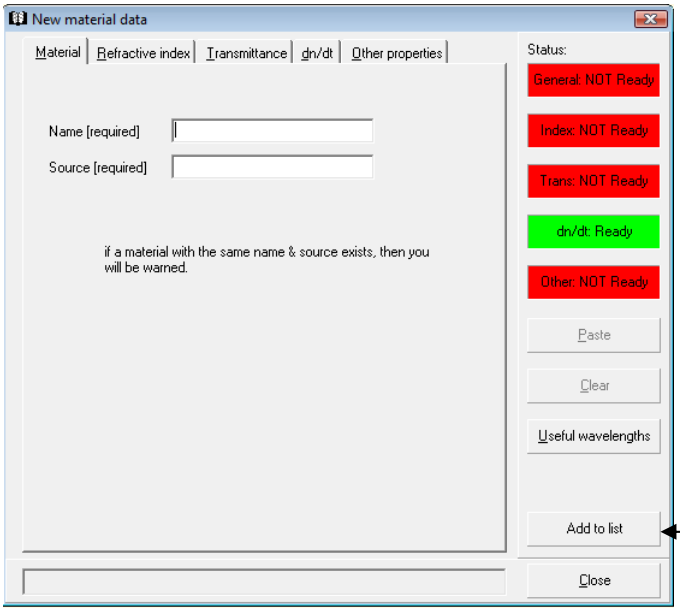
[Buttons along right hand side of form]

From the dropdown list you may choose which programs to update and whether to force an over-write of any matching materials that are present in MatEd and the external programs.

- **Update with selected materials**. You may select one [click] or an adjacent block of glasses [Shift+click defines other end of block]
- **Update all**. Exports all materials in the spreadsheet to the specified programs
- **Synchronise**. Exports all materials in the spreadsheet to the specified programs. Removes any custom materials that are not listed here from the external programs.
- Remove materials. You will be presented with a popup checkbox-dialog of custom materials in the external programs. Check the unwanted glasses and press the 'remove' button in the dialog.

4. 'New/edit' form

The New/edit form is the heart of the program. This is where you will create each new custom material [unless it is imported, Ch 5, or a melt derivative, Ch 8]



Several different kinds of data are required to define a glass:

- Material [its descriptor]
- Refractive Index [raw or as dispersion coefficients]
- Transmittance
- Dn/dt
- Other [chemical/thermal/ mechanical]

Each kind is managed on its own tab. When the data for that tab is ok - for example on the 'Material' tab you must define a glass name and a source [maker] - the relevant status area at right will turn green.

When all five areas are complete, and the status areas are all green, then the material is ready and you may 'Add to list'. The material will then be saved in the local database.

NB at this point the new material is NOT exported to the external programs. You must use the 'Manage' form discussed in the previous chapter to do that.

We will now go thru each tab in detail - as there are some useful tips and tricks.

4.1 Material descriptor

Simply enter the name of the material and the name of the source [this could be its maker or the name of the technical data source

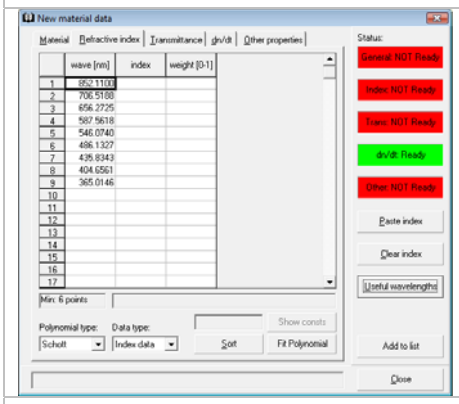
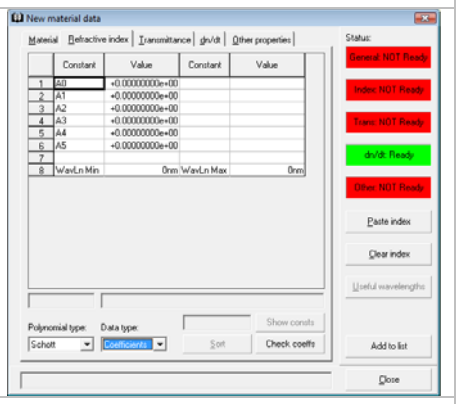
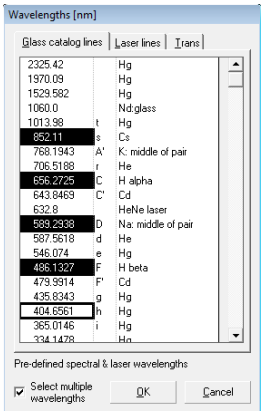
4.2 Refractive Index

Optical design programs need to know the refractive index at any wavelength within the transmittance band of the material.

This data is generated by polynomials of various forms [Schott, Sellmeier etc]. The polynomials have multiple coefficients.

You may supply the coefficients directly. Alternatively you can supply a set of wavelength/index pairs. When you have sufficient pairs MatEd will be able to attempt to fit to your chosen polynomial.

MatEd changes the tab interface according to your choice:

Entering index wavelength pairs	Entering dispersion coefficients
	
Use the 'Useful wavelengths' button to access a popup list of key wavelengths  when the index/wavelength data is entered, click the 'Fit polynomial' button	The names and types of the coefficients will depend upon the type of polynomial selected [dropdown list at bottom left] You will also need to enter main & max wavelengths in the appropriate fields in the spreadsheet. When entered, click the 'Check coeffs' button. If the data is ok, then you will see a popup list of refractive index values at certain wavelengths for you to check.

You can select a single wavelength by just clicking the list.

To multi-select, you must check the box at bottom left.

Then make your selection and press the OK button.

your selections will be entered directly into the spreadsheet - preventing numerical errors.

When the polynomial is OK, the refractive index status panel will go green.

4.3 Transmittance

Transmittance data is very useful. As with the refractive index, this will vary with wavelength. Each material has a clear pass band - outside of which no light passes.

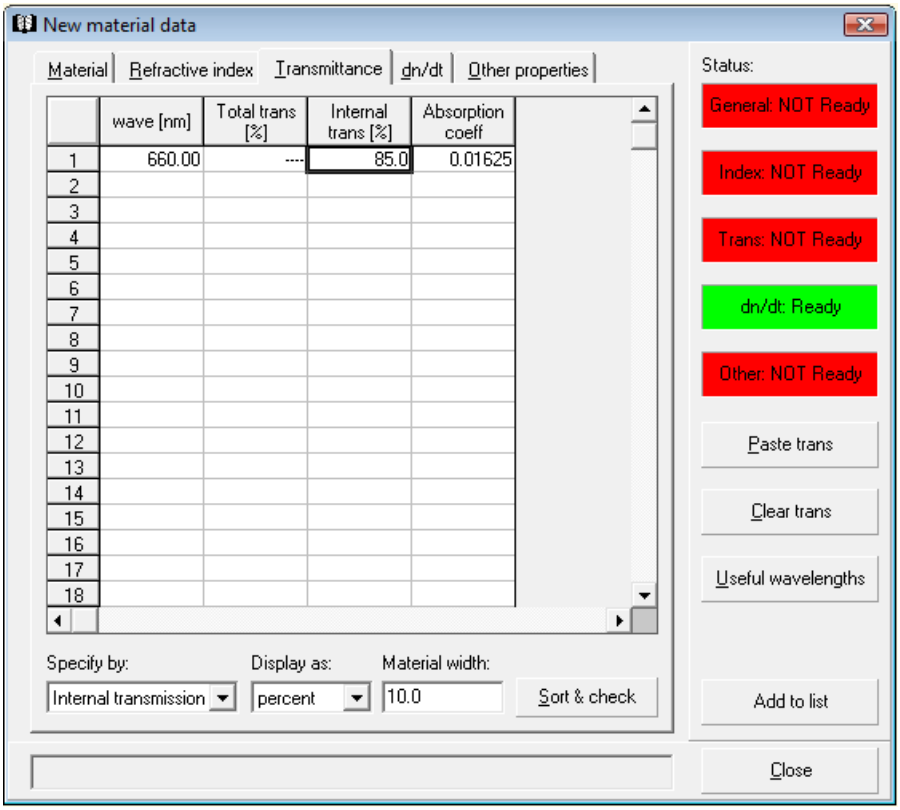
Unlike refractive index, which need to be known to 4, 5, or more decimal places, the exact transmittance values are so critical. Within WinLens3D & GlassManager the transmittance is calculated by linear interpolation between values at known wavelengths.

In fact, in the main programs, the absorption coefficients are known for each glass, and the transmittance calculated on the fly, given the thickness of the material.

When creating a glass in MatEd, we need to give the transmittance / absorption with wavelengths at different points in the waveband.

To set-up the wavelengths easily, you may use the 'Useful wavelengths' button described in the previous section.

This can save many a typing error!



You may choose to supply either:

- Absorption coefficients directly
- Internal transmittance [as a percent]
- Total transmittance [as a percent]

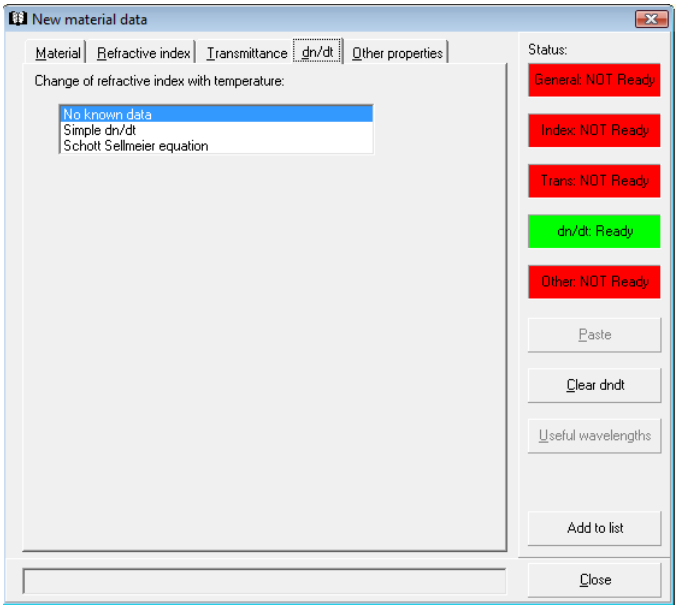
The glass thickness must be specified, and for total transmittance values, you must have the refractive index already setup.

As you enter your wavelength/value pairs, so the dependant values are calculated and displayed as a check.

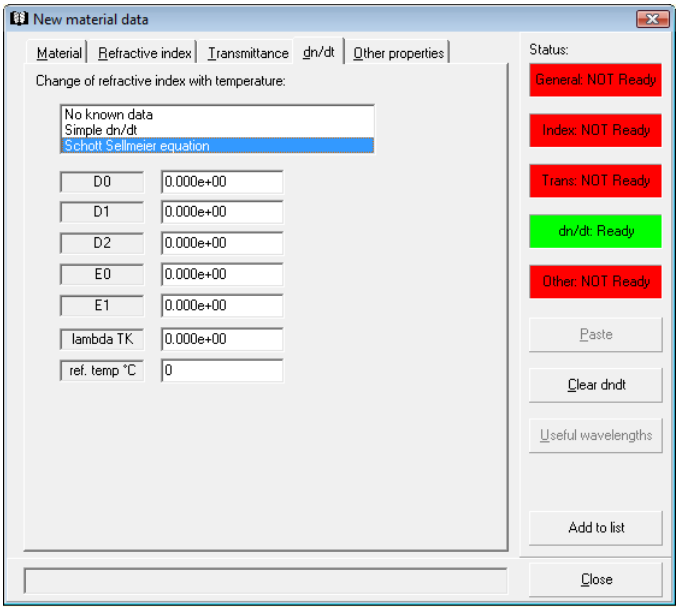
When you have entered you data, click the 'Sort & Check' button. If the data is ok, then the status panel will go green.

4.4 Dndt

This is the thermal coefficient of refractive index against temperature. It is not essential, so the status flag for dndt is always green.



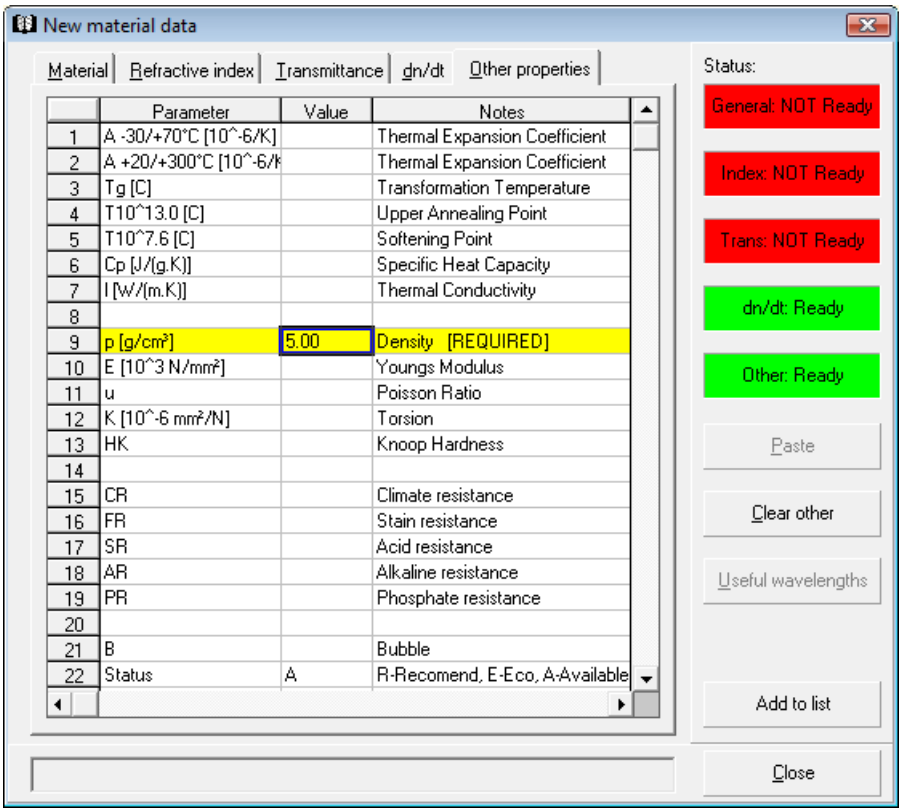
However you may specify it in two ways
As a simple linear value
As the sellmeier type formulae as used by Schott



At present dn/dt is only displayed in Glass Manager and is not yet used for any calculations.

4.5 Other properties

This is a simple list of chemical, thermal and mechanical properties.



	Parameter	Value	Notes
1	A -30/+70°C [10^-6/K]		Thermal Expansion Coefficient
2	A +20/+300°C [10^-6/K		Thermal Expansion Coefficient
3	Tg [C]		Transformation Temperature
4	T10^13.0 [C]		Upper Annealing Point
5	T10^7.6 [C]		Softening Point
6	Cp [J/(g.K)]		Specific Heat Capacity
7	l [W/(m.K)]		Thermal Conductivity
8			
9	p [g/cm³]	5.00	Density [REQUIRED]
10	E [10^3 N/mm²]		Youngs Modulus
11	u		Poisson Ratio
12	K [10^-6 mm²/N]		Torsion
13	HK		Knoop Hardness
14			
15	CR		Climate resistance
16	FR		Stain resistance
17	SR		Acid resistance
18	AR		Alkaline resistance
19	PR		Phosphate resistance
20			
21	B		Bubble
22	Status	A	R-Recomend, E-Eco, A-Available

Only the density [specific gravity] is essential - once that is a valid value [non - zero, the status panel will go green. Remember most glasses have a density somewhere between 2 and 6g/cm3. Therefore treat values of that with some suspision!

The rest of these properties have the standard definitions - the only problematic areas being the chemical properties.

The chemical properties [CR, FR, AR, SR, PR] were derived from the Schott chemical properties - so you may well not have the exact equivalent - for example, other manufacturers may well have similar but different tests. You will have to use your best judgement on these.

4.6 Editing mode

This form is also used when editing an existing material. In such a case the only change is that the 'Add to List' button is replaced ny 'Accept changes' and the title bar shows 'Editing…'

You may access editing mode in two ways:

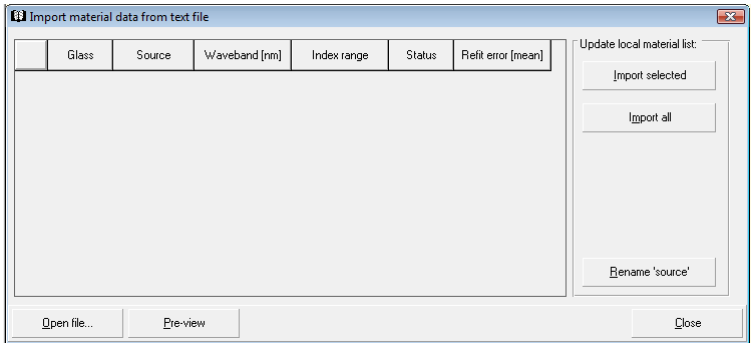
- Via the edit botton on the 'Manage' form
- Via rightclick on the glass list in the main formside bar [when all other forms are closed]

5. 'Import' form

The import form allows you to import glass data from
Material Editor backup [GLZ files]

- Old GLA or GLS files [redundant glass files from early versions of WinLens]
- Oslo GLC files
- Zemax AGF files

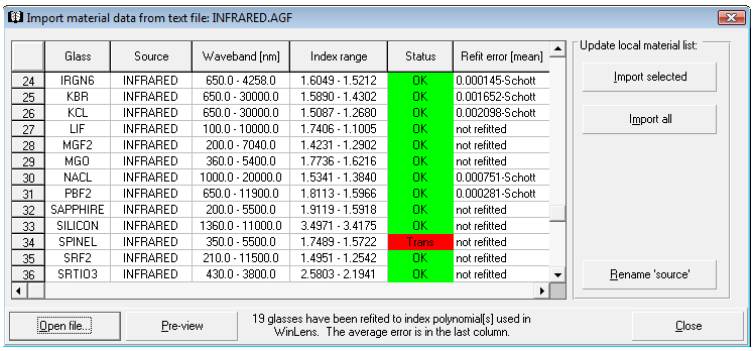
We have noted that sometimes the third party files seem to change format structures.



Click the 'Open File' button at bottom left, and select the file type and then the file, as per normal.

Once you have selected the file, MatEd will display the materials in the spreadsheet. For each glass you can see wether it is suitable for import [green] or unsuitable [red].

When importing third party files there is one potential problem. Oslo and Zemax support more glass polynomial types than Winlens. If MatEd encounters such a type, it will endeavour to fit the raw index data [if any] to a supported polynomial type. The error wil be displayed in a new column at right.



	Glass	Source	Waveband [nm]	Index range	Status	Refit error [mean]
24	IRGN6	INFRARED	650.0 - 4258.0	1.6049 - 1.5212	OK	0.000145-Schott
25	KBR	INFRARED	650.0 - 30000.0	1.5890 - 1.4302	OK	0.001652-Schott
26	KCL	INFRARED	650.0 - 30000.0	1.5087 - 1.2680	OK	0.002098-Schott
27	LIF	INFRARED	100.0 - 10000.0	1.7406 - 1.1005	OK	not refitted
28	MGF2	INFRARED	200.0 - 7040.0	1.4231 - 1.2902	OK	not refitted
29	MGO	INFRARED	360.0 - 5400.0	1.7736 - 1.6216	OK	not refitted
30	NACL	INFRARED	1000.0 - 20000.0	1.5341 - 1.3840	OK	0.000751-Schott
31	PBF2	INFRARED	650.0 - 11900.0	1.8113 - 1.5966	OK	0.000281-Schott
32	SAPPHIRE	INFRARED	200.0 - 5500.0	1.9119 - 1.5918	OK	not refitted
33	SILICON	INFRARED	1360.0 - 11000.0	3.4971 - 3.4175	OK	not refitted
34	SPINEL	INFRARED	350.0 - 5500.0	1.7489 - 1.5722	Trans	not refitted
35	SRF2	INFRARED	210.0 - 11500.0	1.4951 - 1.2542	OK	not refitted
36	SRTIO3	INFRARED	430.0 - 3800.0	2.5803 - 2.1941	OK	not refitted

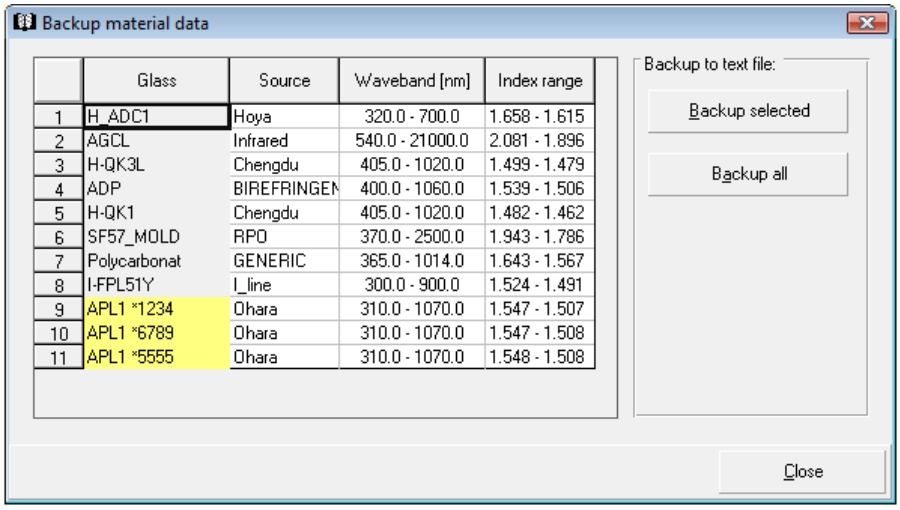
You can 'review' the full data for a material by clicking the 'review' button at center bottom of the form. This will load the data into the 'new/edit/ form - but the data will be un-editable at this point.

You may then choose to import some or all of the glasses using the buttons down the right hand side of the form.

One final nicety: by default the source name is set to the name of the file - you may change this to whatever is appropriate - using the 'Rename source' button at bottom right of the form.

6. 'Backup' Form

The Backup form allows you to save one, some or all of the custom materials to a text file [format .GLZ]



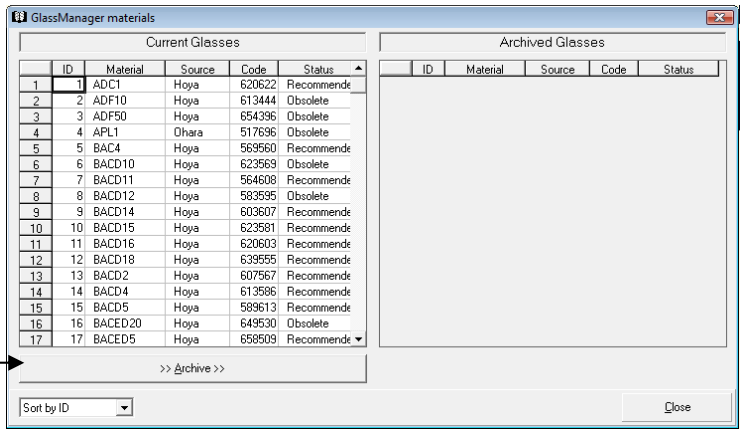
This may be useful:

- To make true backups for yourself
- To send to a colleague along with a WinLens file which uses that custom material. The colleague and can then import the material using his copy of MatEd, and then update his data files.

7. 'Archive' form

The Archive form enables you to move some of the glasses [custom or standard] from the main glass table in Glass Manager into an archive table - and back again.

The idea was - in the early days of Glass Manager - that if you will only use a certain range of glasses, e.g. from one manufacturer, then you could archive all the others.

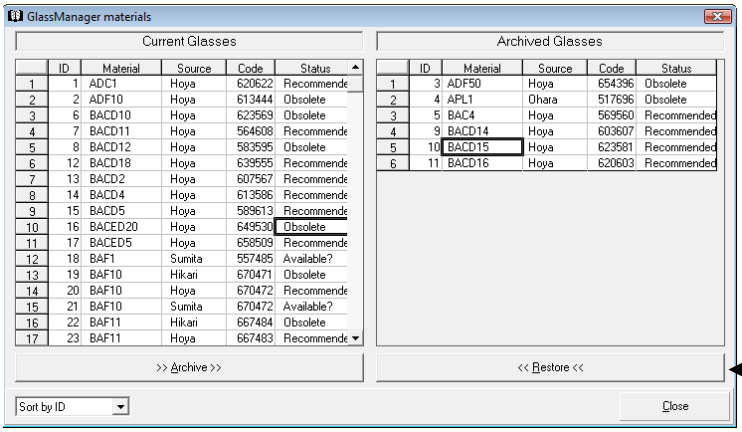


The advantage is that you have many less glasses to choose from. Of course, Glass Manager has developed vastly over the years and now has excellent search capabilities, so this is much less of an advantage than before.

The disadvantage is that you cannot find use the alternative finding tools on archived glasses.

Simply select the ones in the main form that you wish to archive [left hand side] and click the 'Archive' button. You will see the glasses moved across immediately into a similar list on the right hand side.

N.B. you cannot archive or de-archive while Glass Manager is running.



Restoring archived glasses is just as simple. This time select the glasses in the right-hand side list and click the 'Restore' button below. The glasses will be immediately moved back to the main table.

8. 'Melt' form

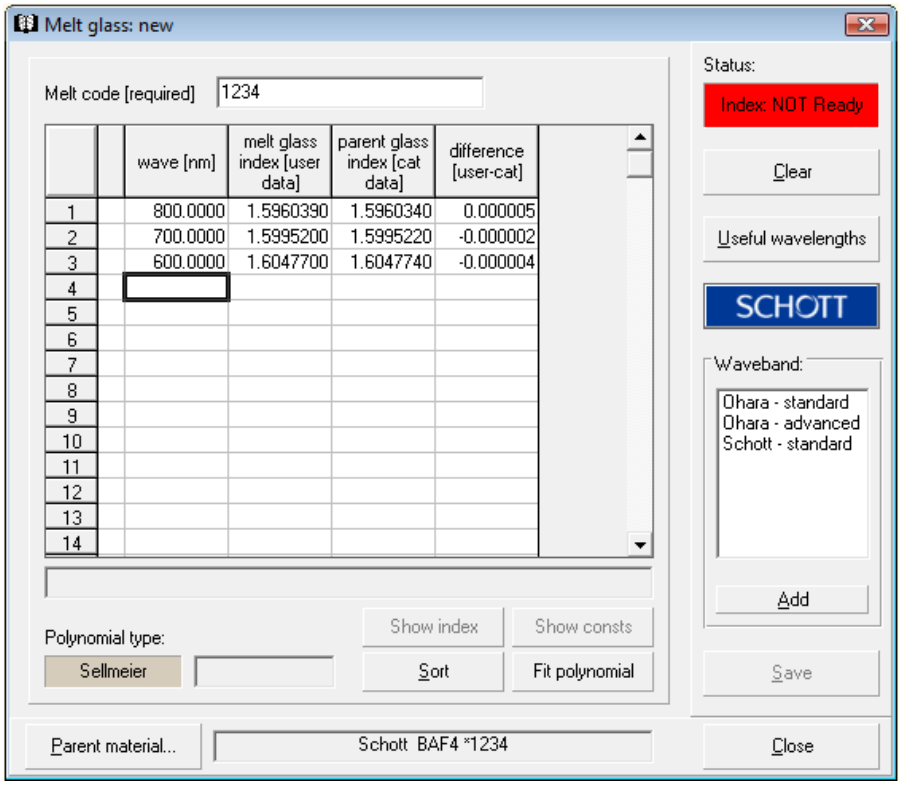
Catalogue data is the average values measured over many 'melts' - there being slight variations from melt to melt. For some designs the refractive index data may be of critical importance - the design may need to be re-optimised for each specific melt.

This data is supplied, on a certificate, by the manufacturer. Typically the certificate shows the measured indices at specific wavelengths.

Melt glasses are not automatically exported to WinLens or GlassManager.

Use the 'Manage' form discussed in Chapter 3.

Material Editor makes it as easy as possible to generate a melt glass, which can then be used in WinLens3D and in Glass Manager.



Instead of entering all the data by hand, you:

- Select the parent glass
- Enter a melt code - this is appended the name of the parent glass to generate the new name
- Enter the refractive index and wavelength values into the spreadsheet shown above.

As you enter a wavelength [column 1], so the program shows the catalogue index value [column 3]. You can then enter the melt index value [column 2]. MatEd will show the difference between the two index values in column 4. This provides valuable feedback on your data entry.

Once you have entered enough index/wavelength pairs - press the 'Fit Polynomial' button. If there are enough data points and if a fit can be achieved, then:

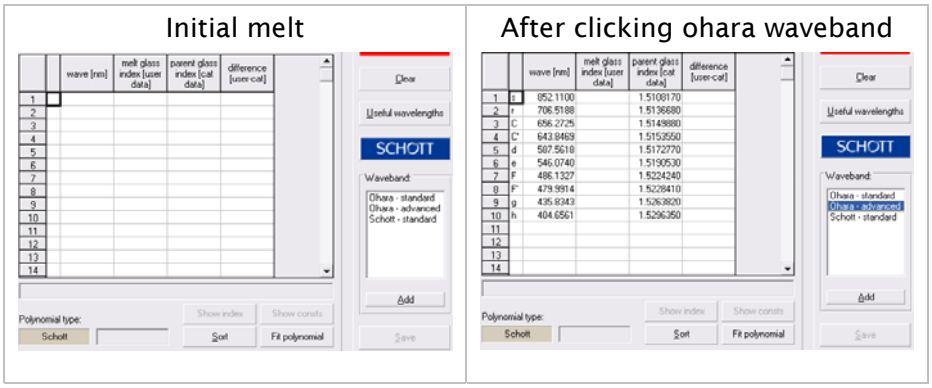
- Status flag goes green

- The difference between the new polynomial values and the catalogue polynomial values will be displayed in column 5, along with the average errors.

There are ways to speed up data entry. You can select one or more wavelength values from the 'Useful wavelength' dialog - button at mid right of form. This is the same dialog discussed in Chapter 4.2.

That alone can save much time and ensures that you have accurate values for any of the standard wavelengths.

Alternatively, you may click on one of the 'wavebands' listed in the 'waveband' dialog. Here this means the set of wavelengths typically used by a manufacturer on their melt sheets. As defaults we supply those of Schott & Ohara.

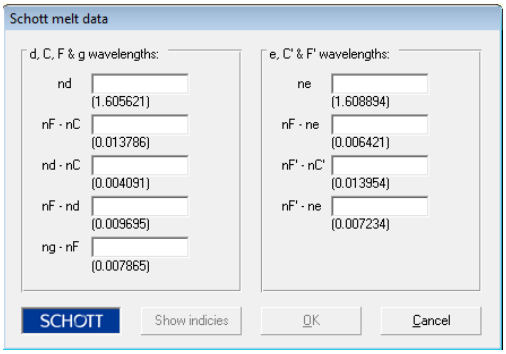


You can also save your own waveband[s] to this list. Setup your wavelengths as above, and then click the 'add' button under the list. You will be prompted for a name for the waveband. Once entered, you may use that whenever you please.

Note: these extra wavebands are stored in the MeltWaveBand.lst text file in the UserData sub folder in the MatEd folder. They have a very simple format, and may be edited at will.

8.1 Schott melt data

If you have a Schott glass the index data is not directly supplied as refractive indicies. Instead it is supplied as dispersions [index differences at specific wavelengths]. Mat Ed allows you to enter this directly instead of having to calculate the index by hand.

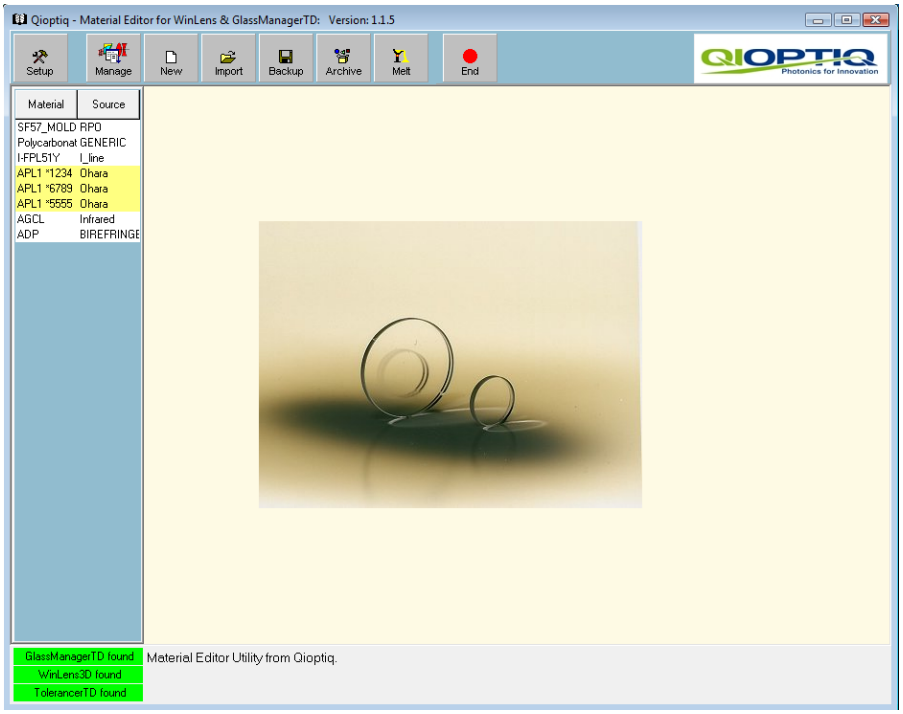


Simply click on the Schott icon [mid left] to launch the appropriate dialog.

All you then need do is enter the data from the melt sheet. As a check, click on the 'Show indices' button, before you click 'OK'. Material Editor will then display the wavelangths and indices in the standard melt spreadsheet for you to fit.

9. Sidebar

The sidebar [down the left hand side] provides a very quick overview of the glasses that you have created in Material Editor.



Whenever you add or delete a glass then its name/source is automatically listed here.

Melt glasses are indicated by a yellow background.

If the child forms are closed, then you may right click a glass name to access other functions:

- Duplicate. Make a copy of the glass, but with an alternative name.
- Edit. Load the glass into the new/edit form - as described in chapter 4. You may make changes to the data.
- Delete. This will remove the glass from the local database. Obviously be carefull

10. Qioptiq LICENSE AGREEMENT

SINGLE USER PRODUCT: this is a legal agreement between you, the end user, and Qioptiq Photonics GmbH & Co Kg, a German corporation. If you do not agree to the terms of this agreement, promptly return the disks and accompanying notes to the place that you obtained them for a full refund.

1. GRANT OF LICENSE: Qioptiq grants you the right to use one copy of the Material Editor software program on a single terminal connected to a single computer (i.e. with a single CPU). You may not network the software or otherwise use it on more than one computer or terminal at a time.

2. COPYRIGHT: Material Editor is owned by Qioptiq or its suppliers (the associated .DLL and .OCX files are the copyright of Microsoft Corporation and its suppliers, FarPoint Technologies Inc & Virtual Media Technology Pty Ltd), and is protected by UK copyright laws, international treaty provisions and all other applicable national laws. Therefore you must treat the software like any other copyrighted material (e.g. a book), except that you may (a) make one copy of Material Editor solely for backup or archival purposes or (b) transfer Material Editor to a hard disk provided you keep the original solely for backup or archival purposes.

3. OTHER RESTRICTIONS: You may not reverse engineer, decompile or disassemble Material Editor. You may transfer your rights under this agreement on a permanent basis provided that you transfer all copies of Material Editor and all written materials and the recipient agrees to the terms of this agreement. Any transfer must include the most recent update and all prior versions.

LIMITED WARRANTY.

LIMITED WARRANTY: Qioptiq warrants that Material Editor will perform substantially in accordance with the accompanying notes for a period of 90 days from date of receipt. Any implied warranties on the software are limited to 90 days.

CUSTOMER REMEDIES: Qioptiq's entire liability and your exclusive remedy shall be, at Qioptiq's option, either (a) return of the price paid, or (b) replacement of the software that does not meet Qioptiq's limited liability and is returned to Qioptiq with a copy of your receipt. This warranty is void if failure of the software has resulted from accident, abuse or misapplication. Any replacement copy of Material Editor will be warranted for the remainder of the original warranty period or 30 days, whichever is longer.

NO OTHER WARRANTIES: Qioptiq disclaims all other warranties, either express or implied, including but not limited to implied warranties of merchantibility and fitness for a particular purpose, with respect to the software and the accompanying notes. The limited warranty contained herein gives you specific legal rights.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES: to the maximum extent permitted by applicable law, Qioptiq and its suppliers shall not be liable for any other damages whatever (including, without limitation, damages for loss of business profits, business

interruption, loss of business information or other pecuniary loss) arising out of the use or inability to use Material Editor, even if Qioptiq has been advised of the possibility of such damages. In any case Qioptiq's entire liability under any provision of this agreement shall be limited to the amount actually paid by you for Material Editor.