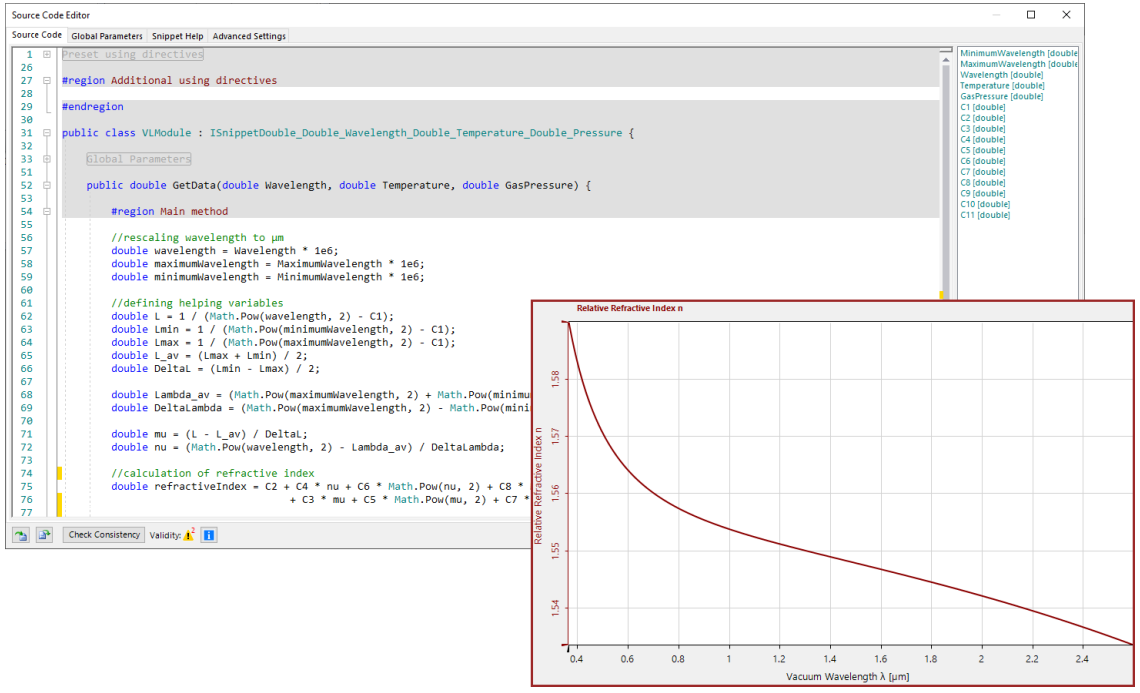
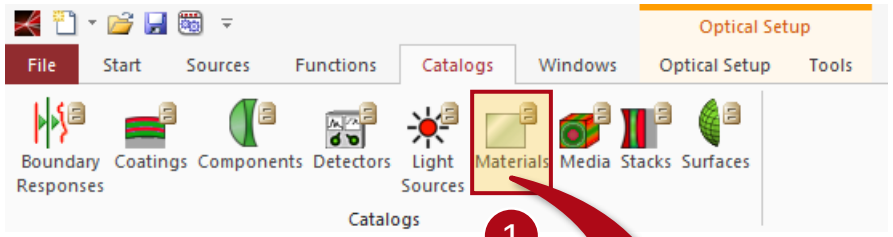
Programmable Dispersion Function

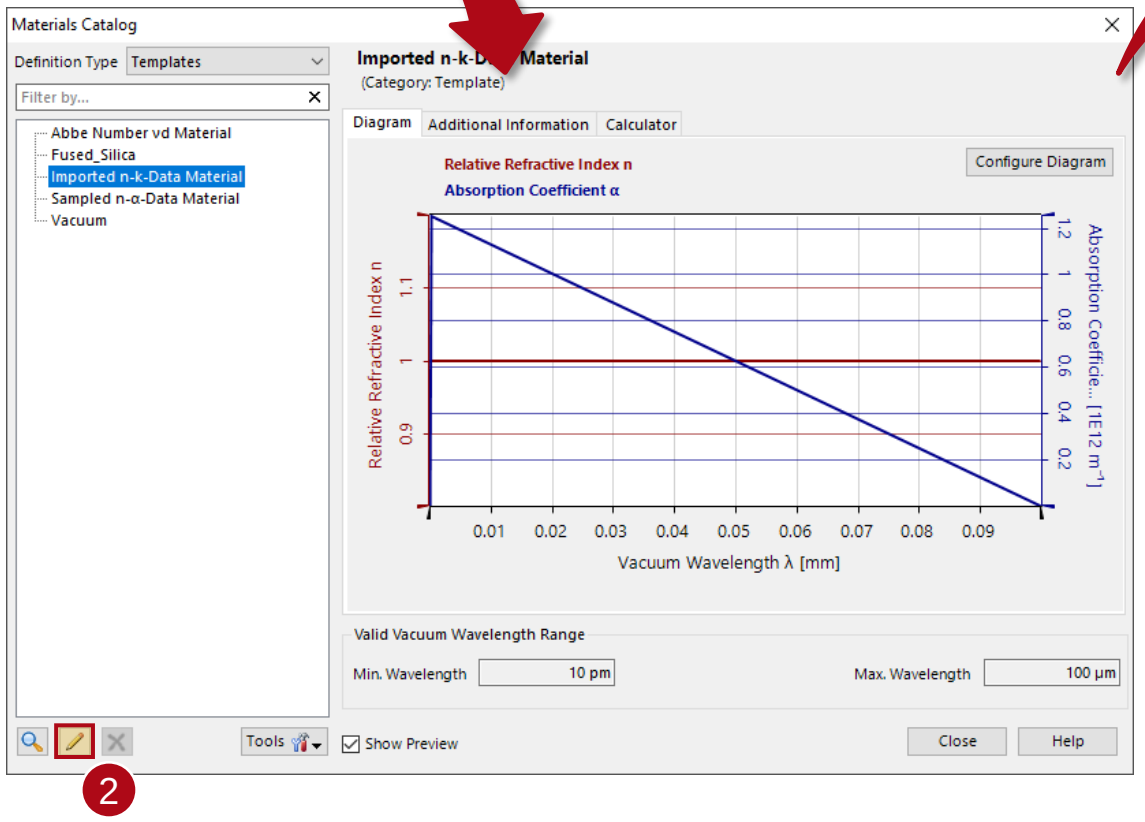
Abstract

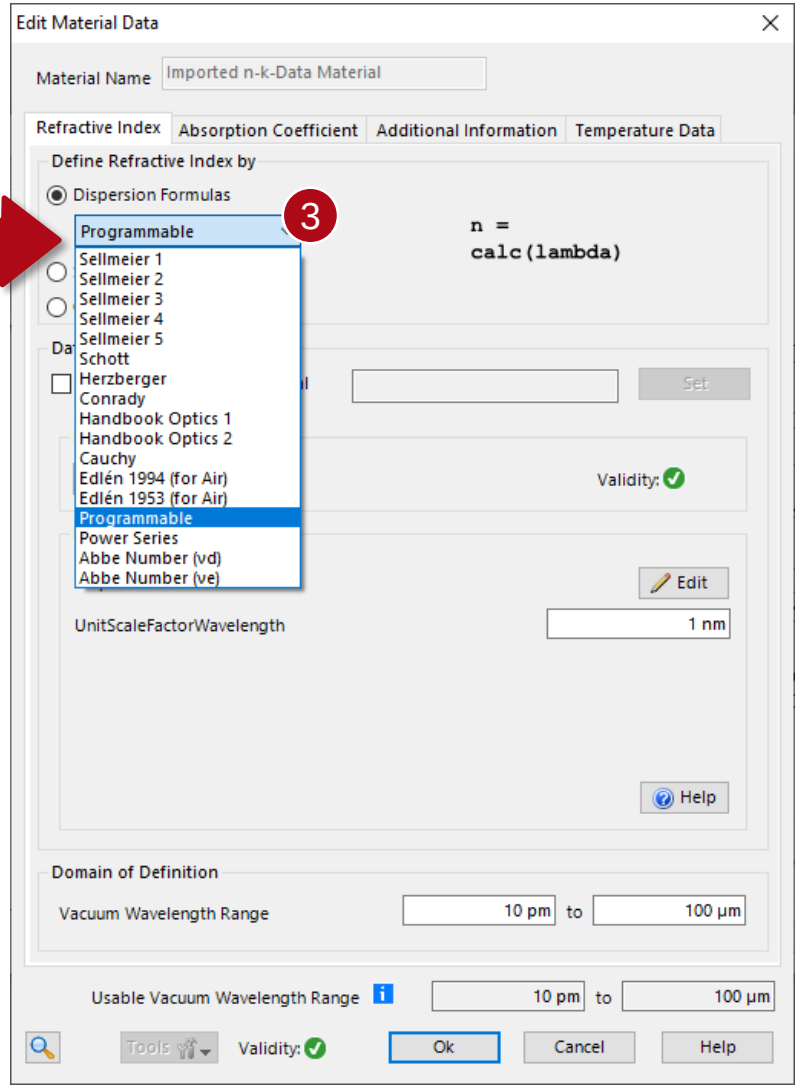


The accurate definition of the optical parameters of materials, such as the refractive index, is a necessity for the modeling of any optical system. One handy option to specify the wavelength-dependent index of refraction are so-called dispersion formulas, which typically provide the data over a large spectral range just by defining a manageable number of coefficients. VirtualLab Fusion is shipped with a wide selection of commonly used dispersion formulars (e.g. Sellmeier, Cauchy), but also allows for an easy programming of additional types. In this document, the programming of a dispersion formula is shown at the example of the glass GOST BK9 by applying the Reznik definition.

Definition of Materials by Dispersion Formulas n(λ)







Note: Please keep in mind, that in this case the refractive index and the absorption coefficient both can and need to be defined by their own Snippet.

Example: Reznik Dispersion Formula n(λ)

Definition of Reznik formula:

$$n(\lambda) = c_2 + c_4\nu + c_6\nu^2 + c_8\nu^3 + c_{10}\nu^4 + c_3\mu + c_5\mu^2 + c_7\mu^3 + c_9\mu^4 + c_{11}\mu^5$$

with:

$$\nu = \frac{\lambda^2 - \lambda_{av}}{\Delta\lambda} \text{ and } \mu = \frac{L - L_{av}}{\Delta L}$$

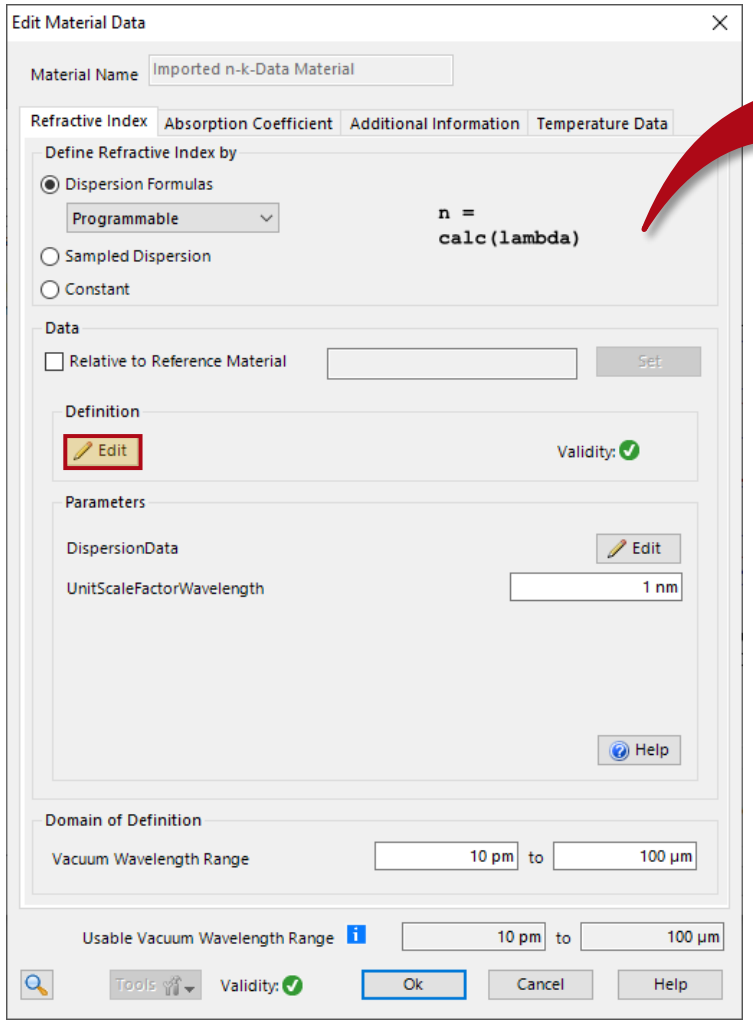
and:

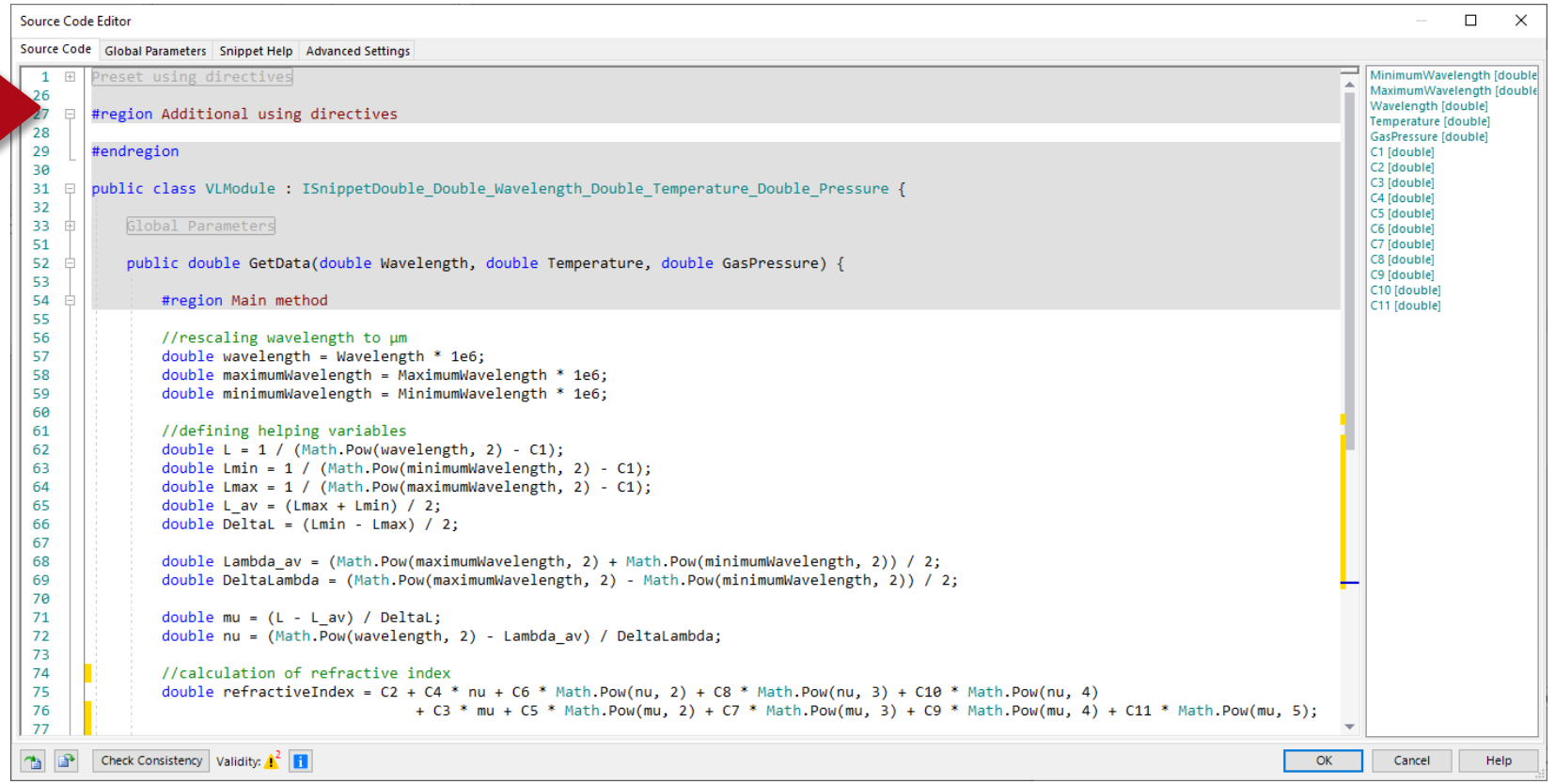
$$L = \frac{1}{\lambda^2 - c_1}, L_{min} = \frac{1}{\lambda_{min}^2 - c_1}, L_{max} = \frac{1}{\lambda_{max}^2 - c_1}, L_{av} = \frac{L_{max} + L_{min}}{2}, \Delta L = \frac{L_{min} - L_{max}}{2}$$

and:

$$\lambda_{av} = \frac{\lambda_{max} + \lambda_{min}}{2}, \Delta\lambda = \frac{\lambda_{max} - \lambda_{min}}{2}$$

Example: Reznik Dispersion Formula n(λ)





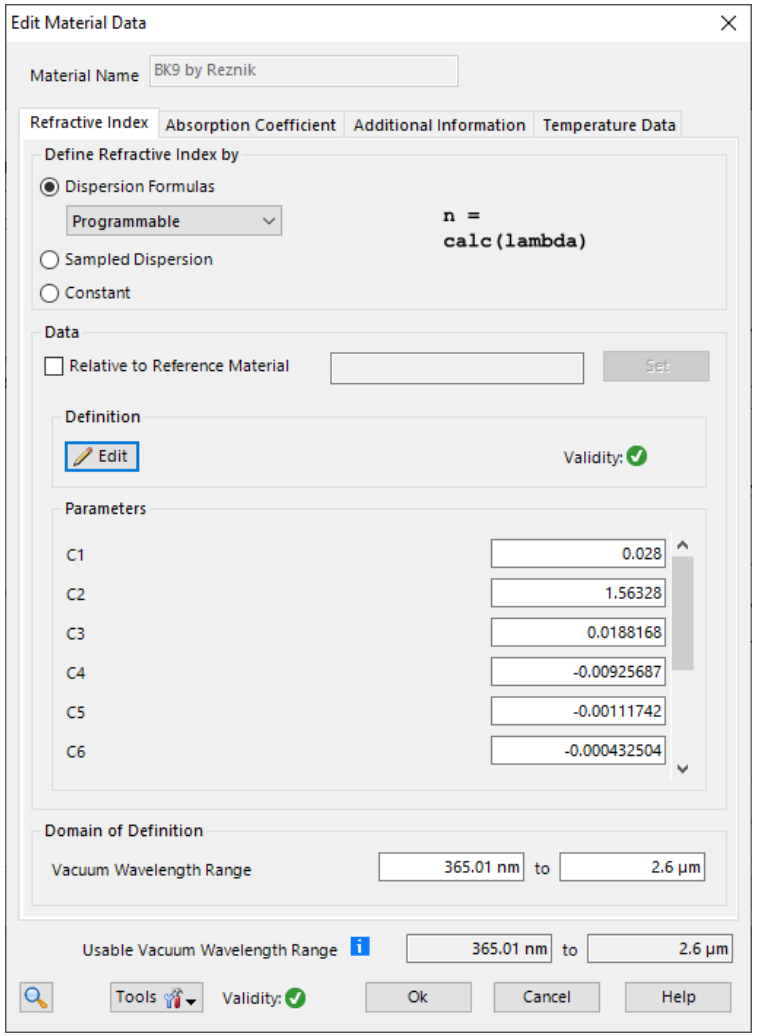
In the *Source Code Editor* local and global variables can be defined (e.g. for the coefficients) and it enables the definition of the desired dispersion formula.

GOST BK9 with Reznik Dispersion Formula

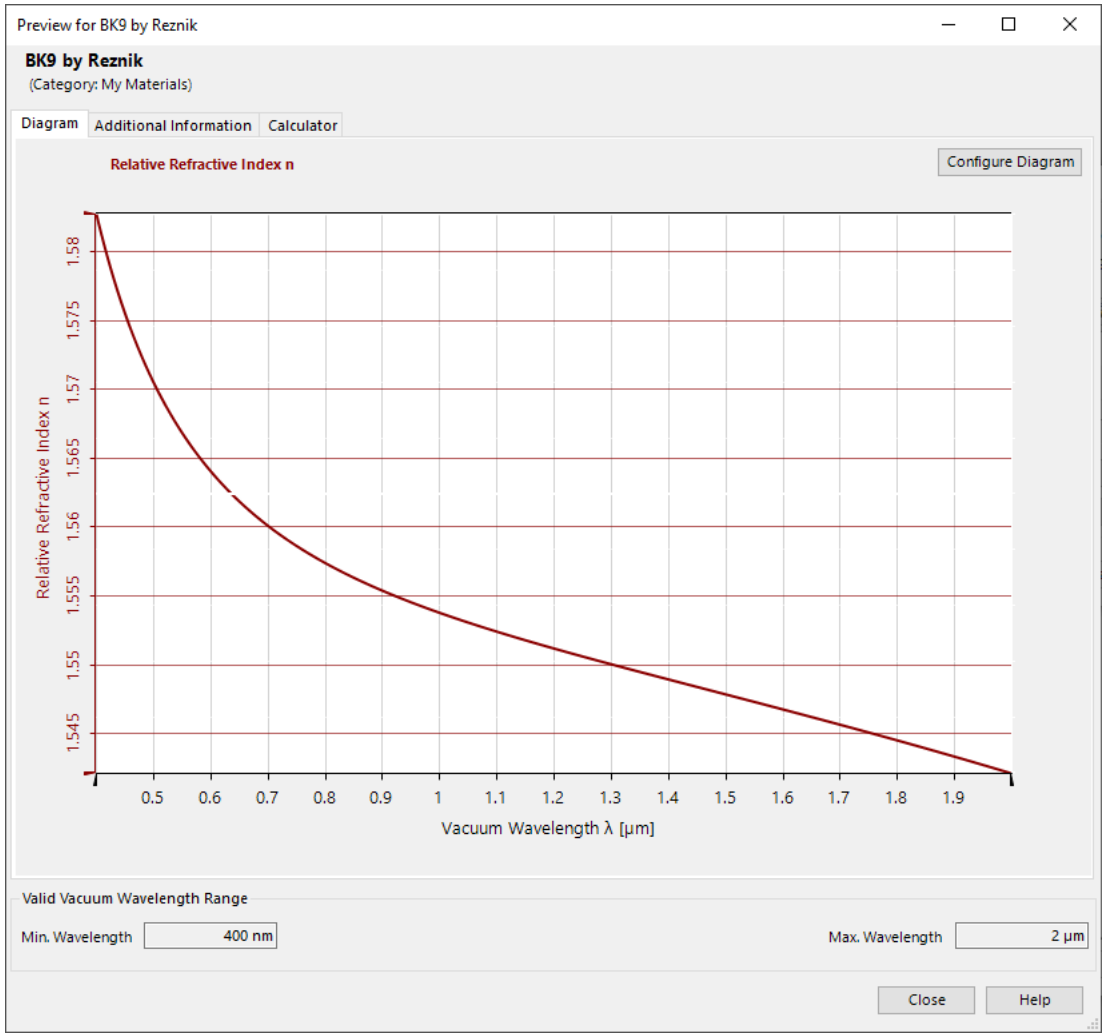
Data for BK9:

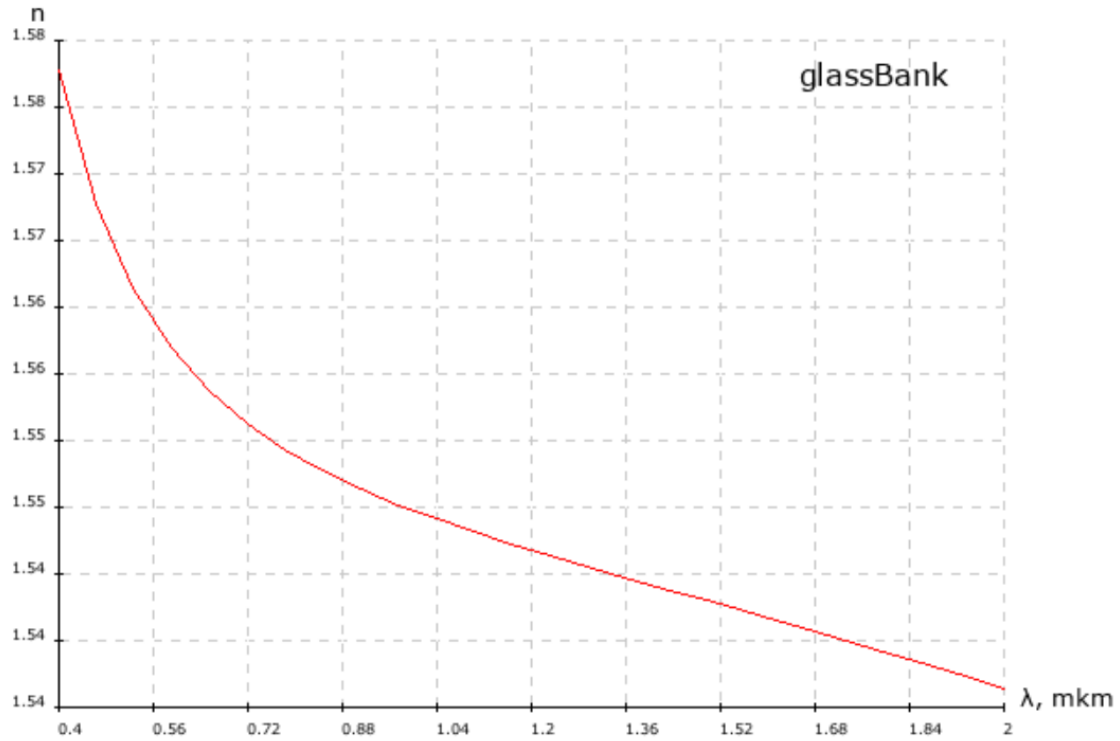
- c_1=0.028
- c_2=1.56328
- c_3=0.0188168
- c_4=–0.0925687
- c_5=–0.00111742
- c_6=–0.0000432504
- c_7=0.000167343
- c_8=0
- c_9=0
- c_{10}=0
- c_{11}=0

source: GlassBank website
http://glassbank.ifmo.ru/eng/prop.php?id=318



Comparison for GOST BK9





source: GlassBank website
http://glassbank.ifmo.ru/eng/n_wl_graf.php?id=318

Document Information

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Keywords

- SWF.0026, Materials, Media, Catalog, Medium Catalog, Material Catalog, Customization, Medium, Material, Dispersion, Dispersion Formula, Reznik, Reznik Dispersion, Reznik Dispersion Formula

Short Abstract

- This Use Case introduces the Programmable Medium and shows how to customize your own dispersion Formula.

Marketing Picture