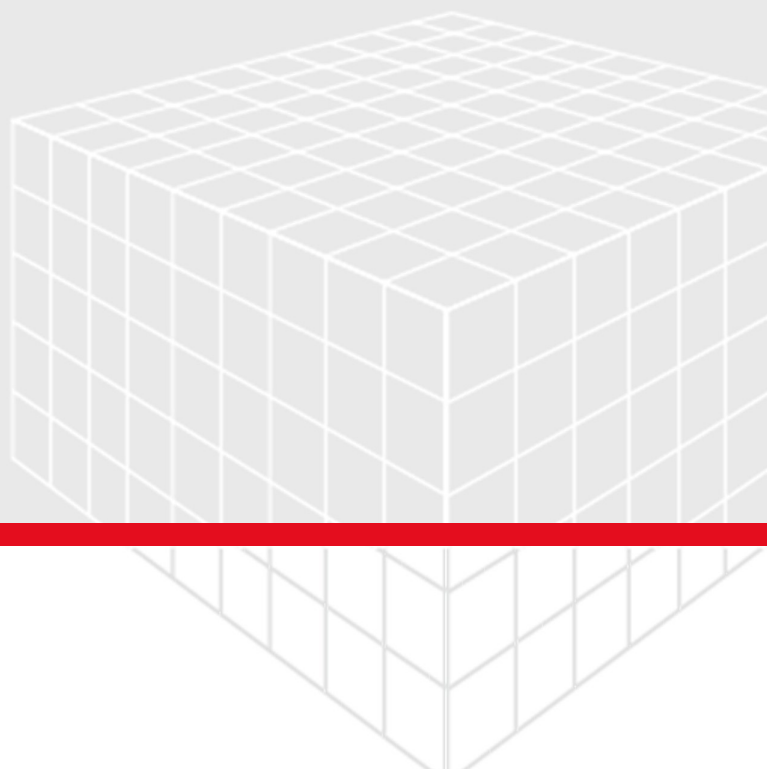


LayerGeo

User Guide

GEODICT Release 2026

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GEO DICT

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LayerGeo

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1 LayerGeo

ProcessGeo and LayerGeo are GeoDict's structure modifiers. Often, ProcessGeo and LayerGeo are used sequentially, together with GeoDict's structure generators or with ImportGeo to create complex structures. The imported or generated structures are modified with ProcessGeo and then combined using LayerGeo by attaching, adding, or subtracting structures as different layers.

Access the LayerGeo module by selecting **Model** → **LayerGeo** in the menu bar.

Learn to use LayerGeo:

- [Attach](#)  4
Another structure can be attached to a side of the current structure which has the same voxel dimensions.
- [Add](#)  12
Two structures are kind of merged together: they are layered in the same domain causing overlap.
- [Subtract](#)  20
Another structure is subtracted from the current one, which means parts of the current structure are removed.



Join the conversation

Visit the Community on [GeoDict Forum](#) to be inspired and get answers to top questions.

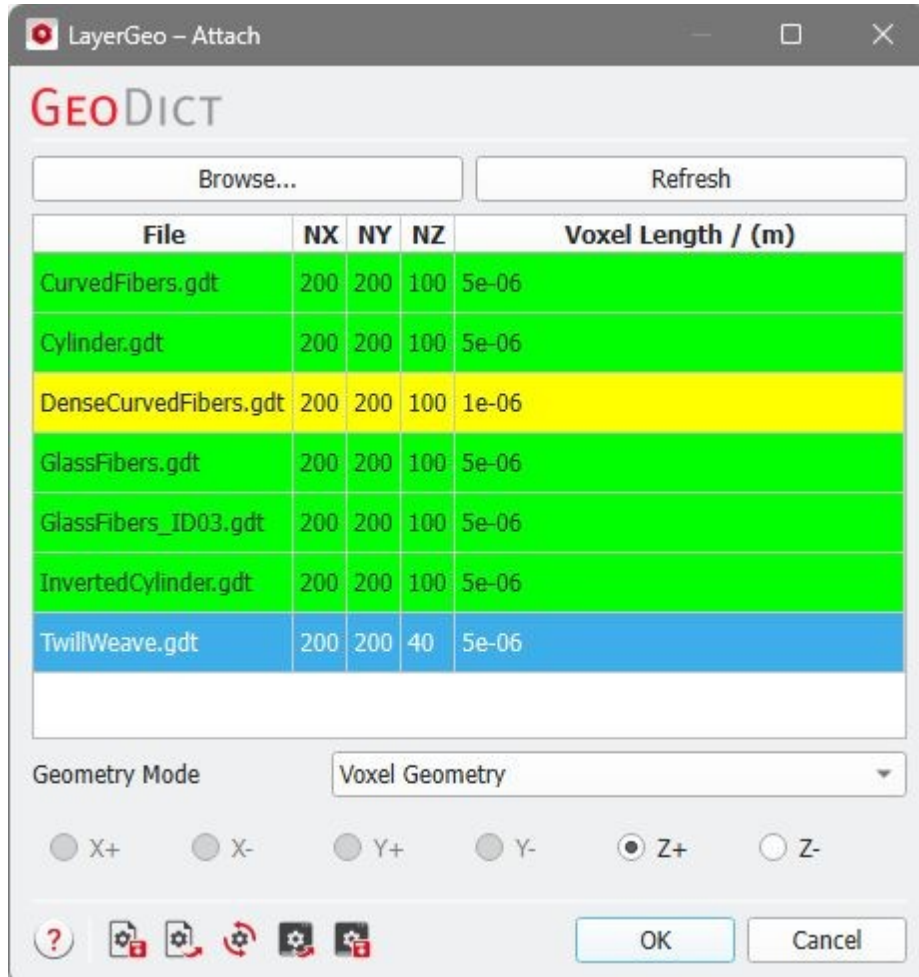
Find illustrative application examples on the [website](#).

Our tutorials and seminar videos give you a first hands-on experience. They are collected in the [Learning Center](#).

Send your [Support Request](#) to our technical Support.

1.1 Attach

Structures that fit in at least two dimensions and in the voxel length in relation to the current structure can be attached to one side of it. This enlarges the domain size.



The options dialog shows a table with all files in GDT, GAD, and .leS formats present in the current project folder. To choose a project folder, select **File** → **Choose Project Folder** → **Select Project Folder...** in the menu bar beforehand. By clicking **Browse...**, you can also choose files from another directory. Clicking **Refresh** updates the table, e.g., after a new file is added to the currently selected folder.

The rows with the file names in the table take colors depending on their size and voxel length in relation to the current structure loaded in GeoDict:

- **Green**: Names of files containing a structure whose dimensions match in all three directions (NX, NY and NZ) and in the voxel length.
- **Yellow**: Names of files containing a structure whose dimensions match in only two directions, or do not have a matching voxel length.
- **Not highlighted**: Non-matching structures are not highlighted.

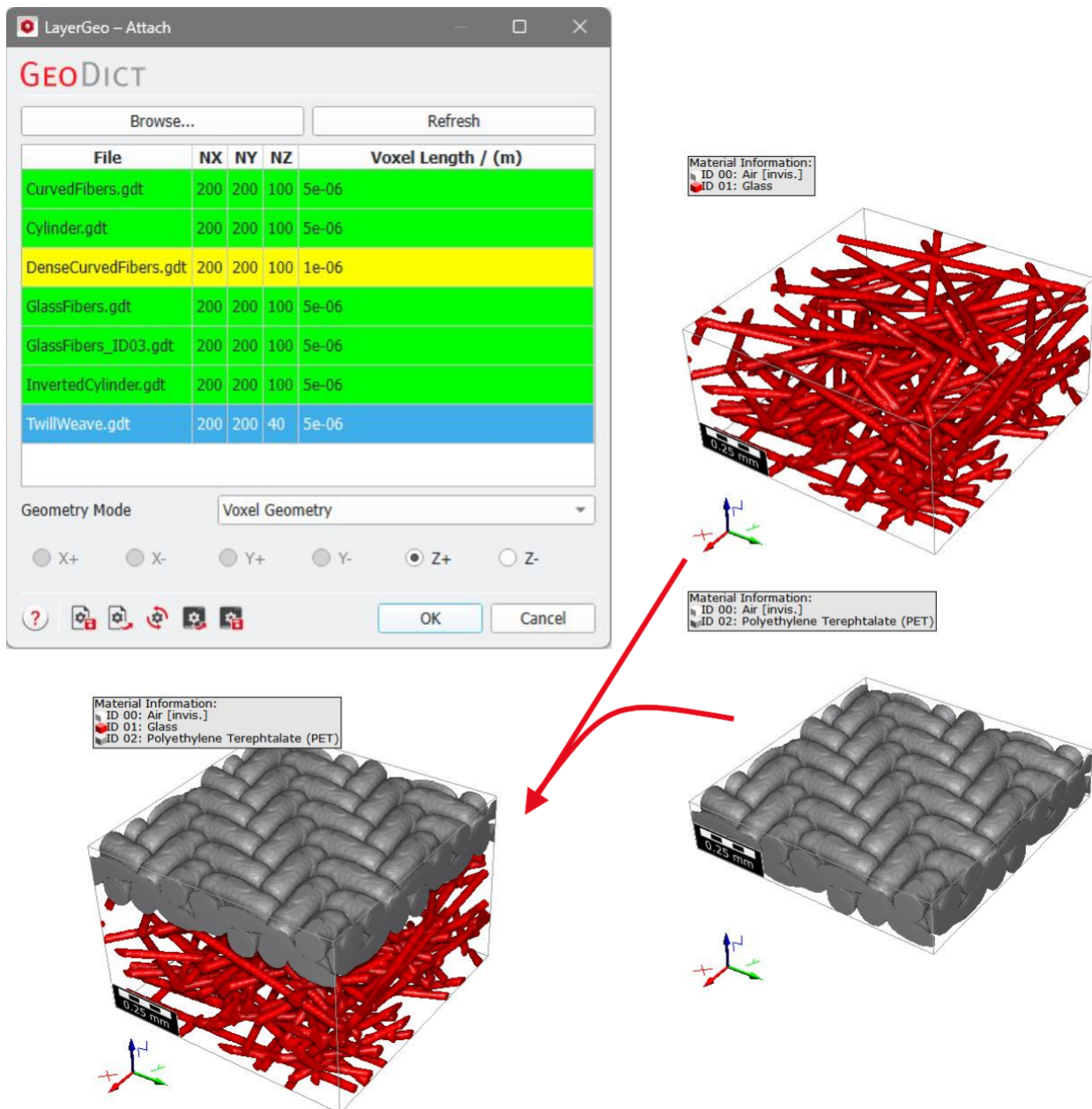
To select a structure, click on its name. The name of the selected structure is then highlighted in blue.

Below the table, the choice of **Geometry Mode** defines if the **Voxel Geometry** or the **Analytic Data** is used. At the bottom of the dialog, the direction in which the structures will be attached must be selected. Directions in which the selected structure cannot be attached are grayed out and not selectable.

Voxel Geometry

As default geometry mode, the **Voxel Geometry** is chosen. In this mode, the structures are attached based on the voxel information alone. If analytic data was present in the geometry files before, this data is discarded.

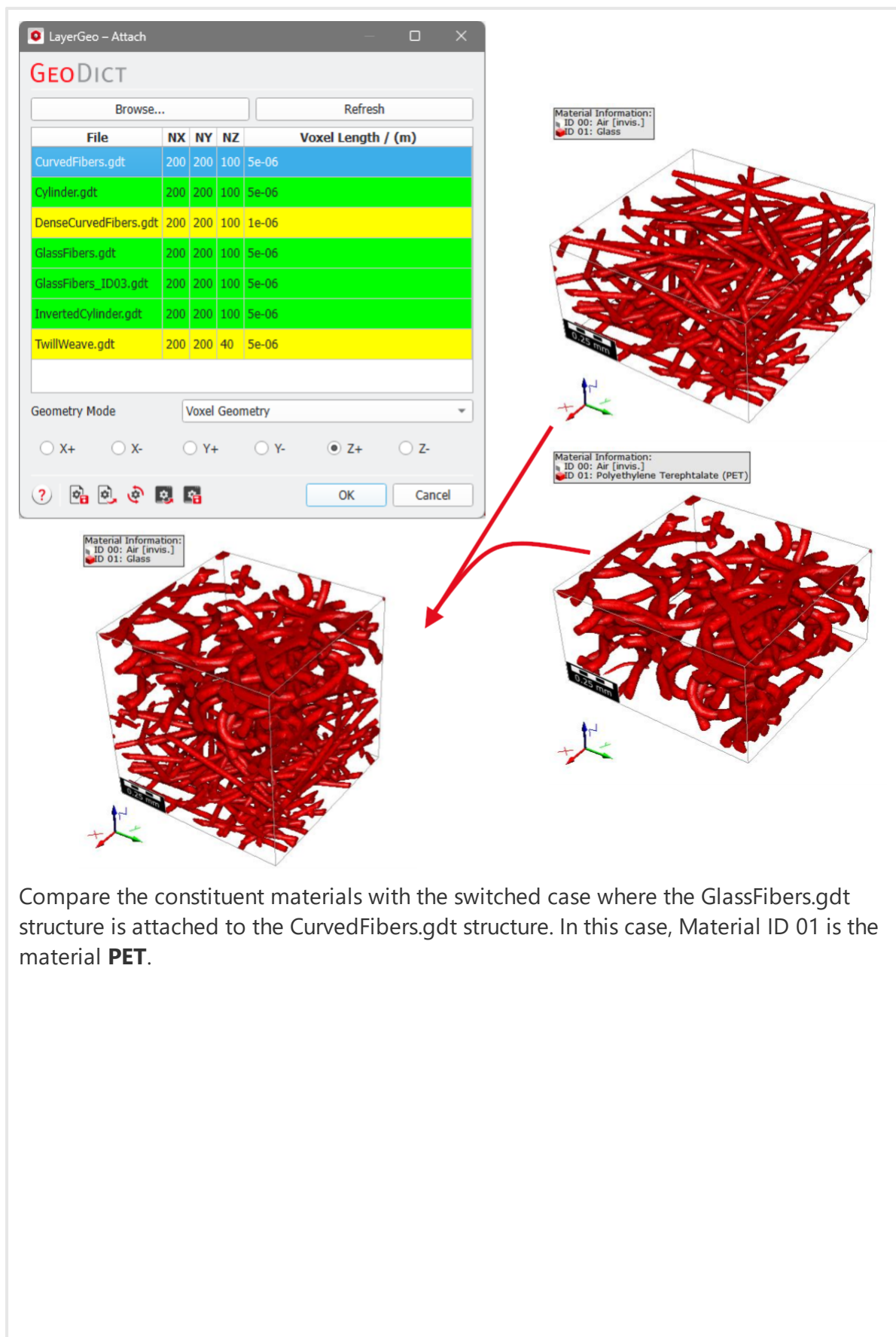
For example, with the GlassFibers.gdt in memory (original structure, with a grid size of 200 x 200 x 100 voxels), the TwillWeave.gdt, with a grid size of 200 x 200 x 40 voxels, appears in yellow. This means only two dimensions, the X- and the Y-dimension, fit to the loaded structure. Thus, the TwillWeave.gdt file can be selected (highlighted blue) and can be attached in either the Z+ or Z- direction. The other directions (X+, X-, Y+, and Y-) are grayed out and not selectable.



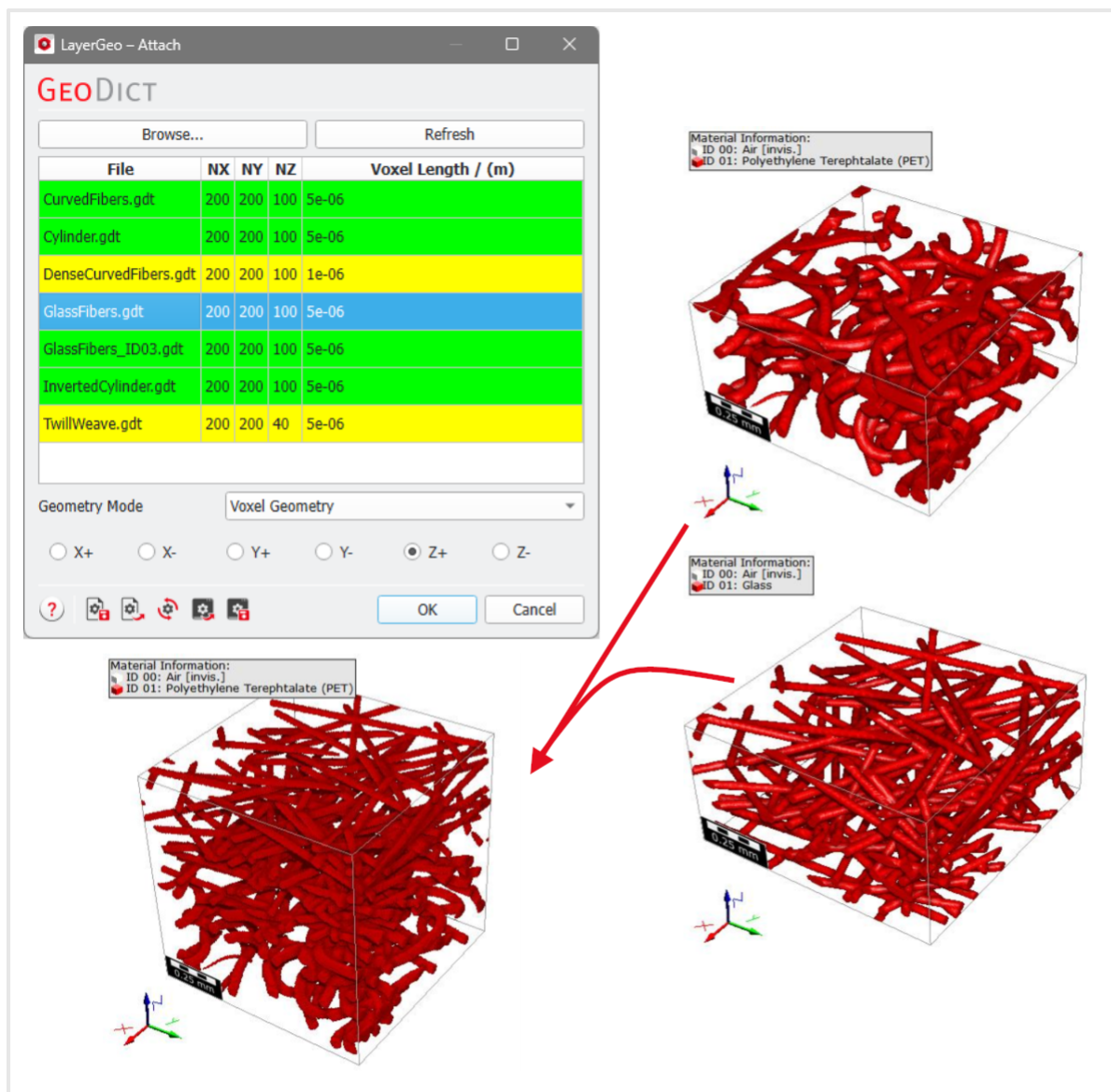
✓ What happens to the materials when I use the Voxel Geometry mode?

In the Voxel Geometry mode, the Material IDs and the associated materials are kept. If the original structure and the attached structure contain objects with the same Material ID, the constituent material of the original structure is kept.

For example, GlassFibers.gdt, containing glass fibers, is used as original structure and CurvedFibers.gdt, containing PET fibers, is attached to it. Individually, the glass fibers and the PET fibers in both structures are assigned to **Material ID 01**. The combined structure uses the constituent material information of the original structure (GlassFibers.gdt), and so, takes on **Glass** as the constituent material of Material ID 01.

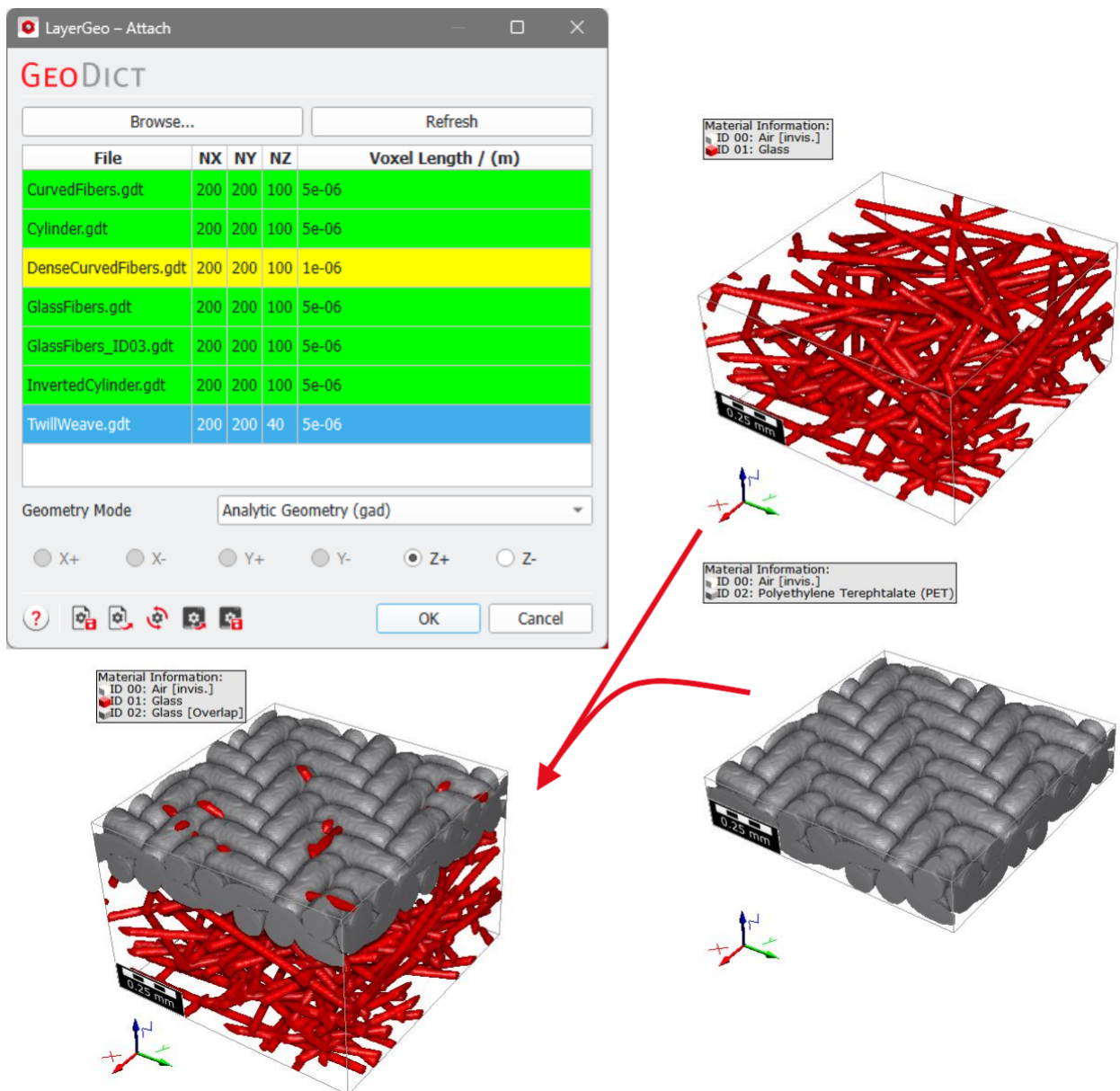


Compare the constituent materials with the switched case where the GlassFibers.gdt structure is attached to the CurvedFibers.gdt structure. In this case, Material ID 01 is the material **PET**.

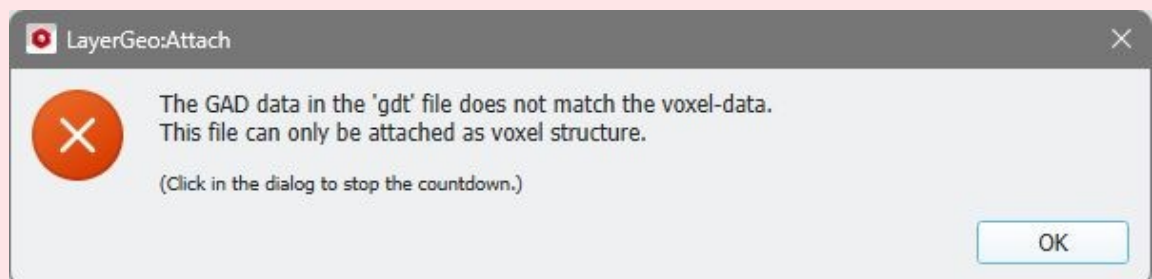


Analytic Geometry

If the loaded structure contains analytic data, the **Analytic Geometry (gad)** mode becomes available. Here, the analytic objects are attached and GAD objects outside of the current domain may become visible in the extended domain. Thus, overlap might exist between the structures. Below, the same structures as before are attached, but now with the geometry mode **Analytic Geometry (gad)**. Some of the glass fibers leave the original domain and become visible in the extended domain.



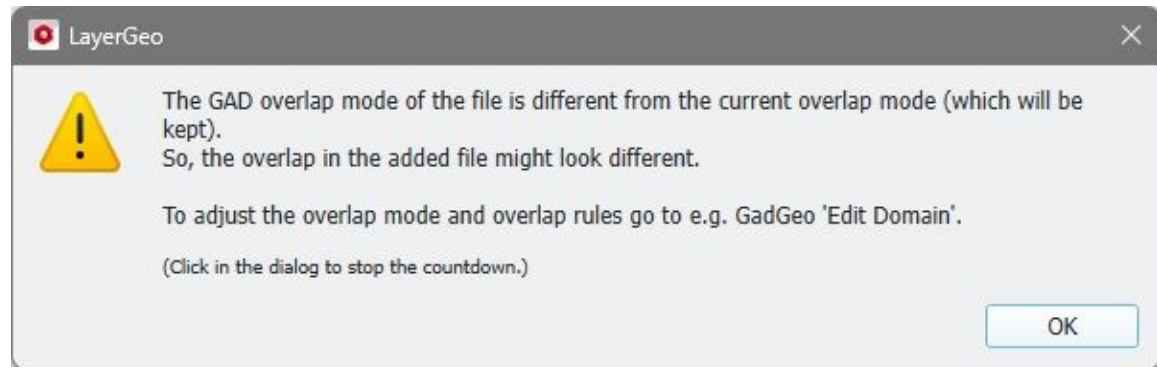
Important! This works only when the files of both structures (the chosen file and the current structure) contain analytic information. If the structure to attach does not contain analytic data and you click **Run**, an error message will appear. Change the **Geometry Mode** to **Voxel Geometry** to attach the structure.



✓ How is the overlap handled?

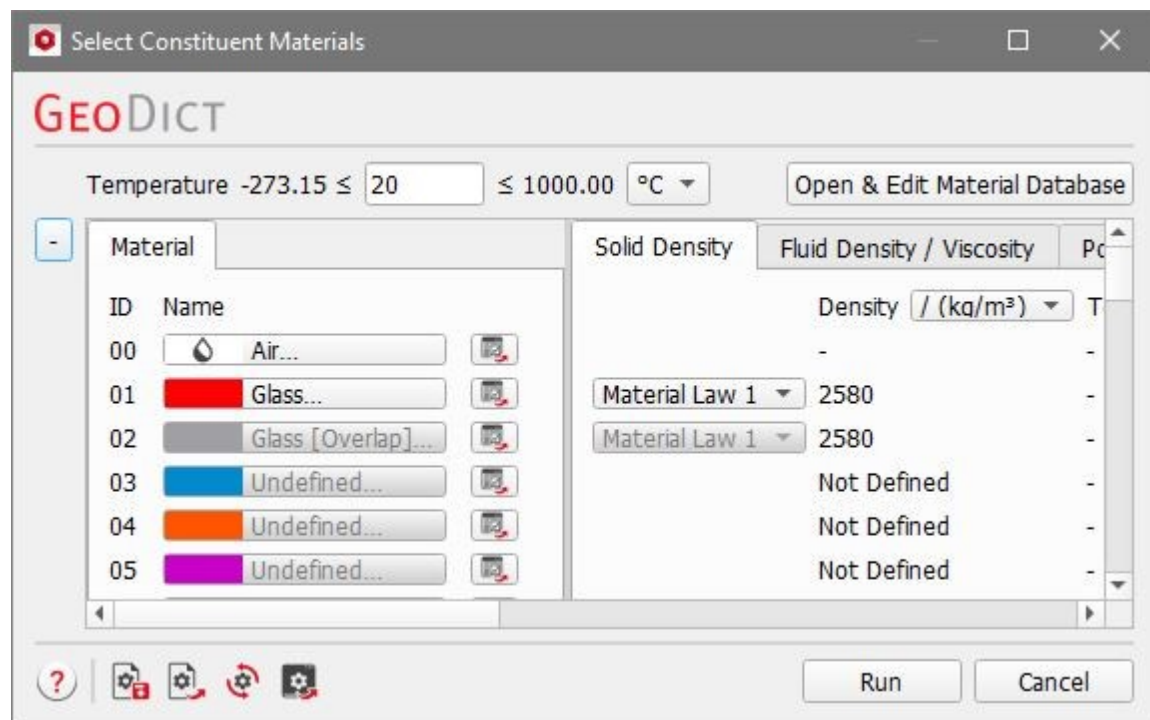
In the **Analytic Geometry** mode, the overlap rules are defined by the currently loaded structure. They can be changed using **GadGeo – Edit Domain** (find a detailed explanation in the GadGeo chapter).

If the overlap rules in the attached structure are different from those in the current structure, a warning will appear. After the attaching you can change the overlap rules in the **Edit Domain** dialog.



✓ What happens to the materials when I use the Analytic Geometry mode?

In the **Analytic Geometry** mode, the constituent materials from the currently loaded structure are used. This also holds if a Material ID appears in both structures. In the example above, the constituent material of Material ID 02 of the GlassFiber.gdt structure is **Glass [Overlap]**.



When attaching the TwillWeave.gdt structure, Material ID 02 is assigned to Glass.

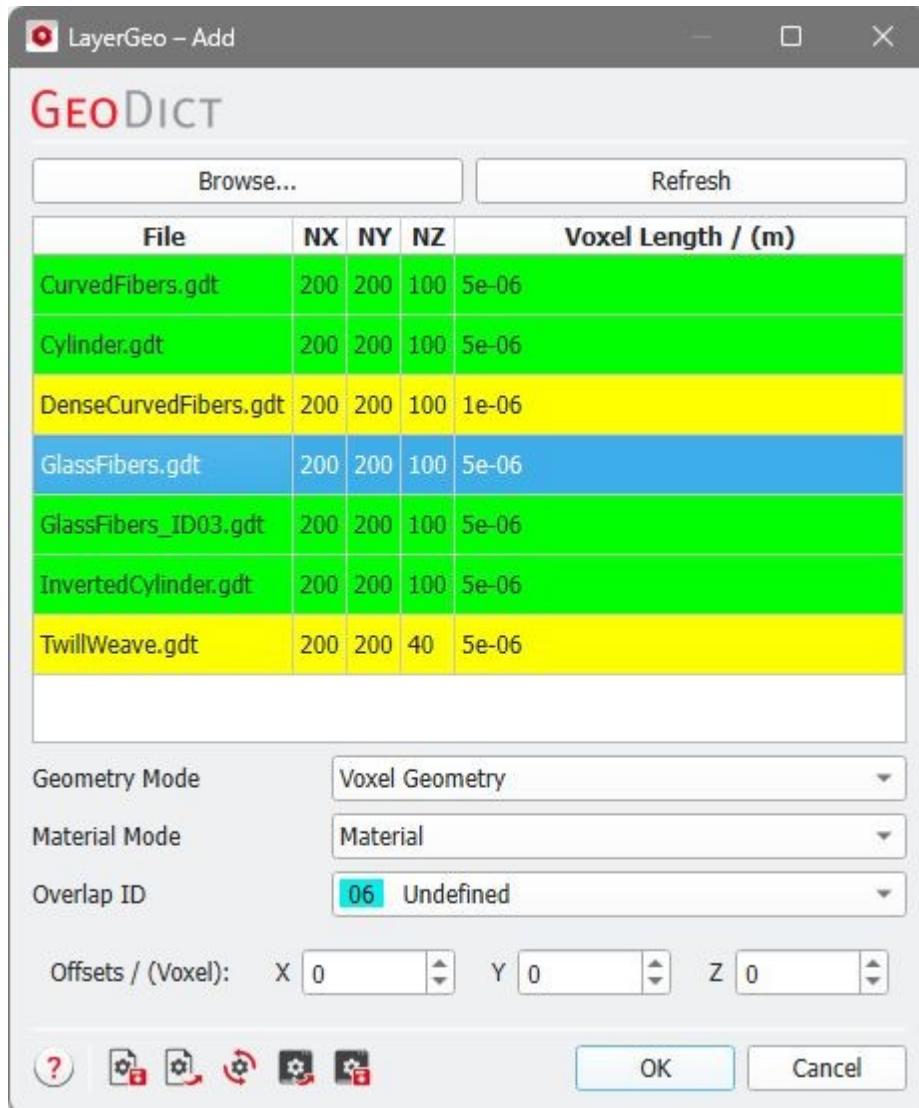
You can change the materials in the **Select Constituent Materials** dialog before or after attaching the structures, which will also depend on the overlap handling of the current structure.



Know how! If the direction is erroneously selected, click the **Undo** icon , in the menu bar, and attach the structure again in the correct direction.

1.2 Add

The **Add** mode allows to combine a structure with the original structure in such a way that both occupy the same domain. Adding structures commonly results in overlap between the original and the added structure.



The options dialog shows a table with all files in GDT, GAD, and .leS formats present in the current project folder. To choose a project folder, select **File → Choose Project Folder → Select Project Folder...** in the menu bar beforehand. By clicking **Browse...**, you can also choose files from another directory. Clicking **Refresh** updates the table, e.g., after a new file is added to the currently selected folder.

The rows with the file names in the table take colors depending on their size and voxel length in relation to the current structure loaded in GeoDict:

- Green:** Names of files containing a structure whose dimensions match in all three directions (NX, NY and NZ) and in the voxel length.
- Yellow:** Names of files containing a structure whose dimensions match in only two directions, or do not have a matching voxel length.

- Not highlighted: Non-matching structures are not highlighted.

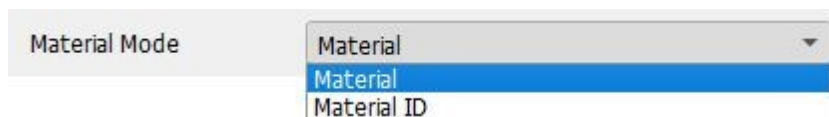
To select a structure, click on its name. The name of the selected structure is then highlighted in blue.

Below the table of the available structures, the choice of **Geometry Mode** defines if the analytic data or the voxel geometry is used. The **Material Mode** defines the overlap behavior between the original and the added voxel structure if **Voxel Geometry** is selected. For the **Analytic Geometry** mode, the overlap behavior is given by the current structure. Finally, an **Offset**¹⁷ can be entered.

Voxel Geometry

As default Geometry Mode, the **Voxel Geometry** is chosen. In this mode, the structures are added based on the voxel information alone. If analytic data was present in the geometry files before, this data is discarded.

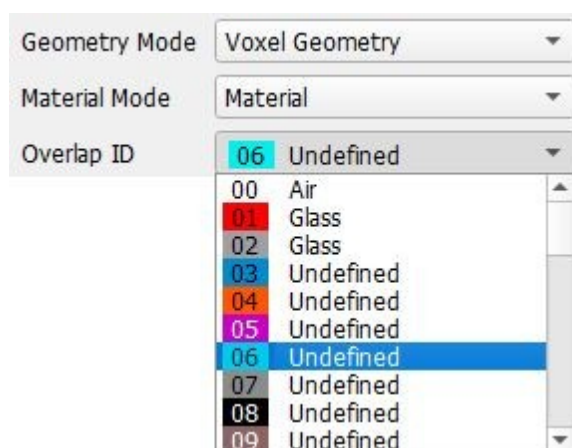
As **Material Mode** you can choose between **Material** and **Material ID**, which defines the Material ID of the overlapping structure parts.

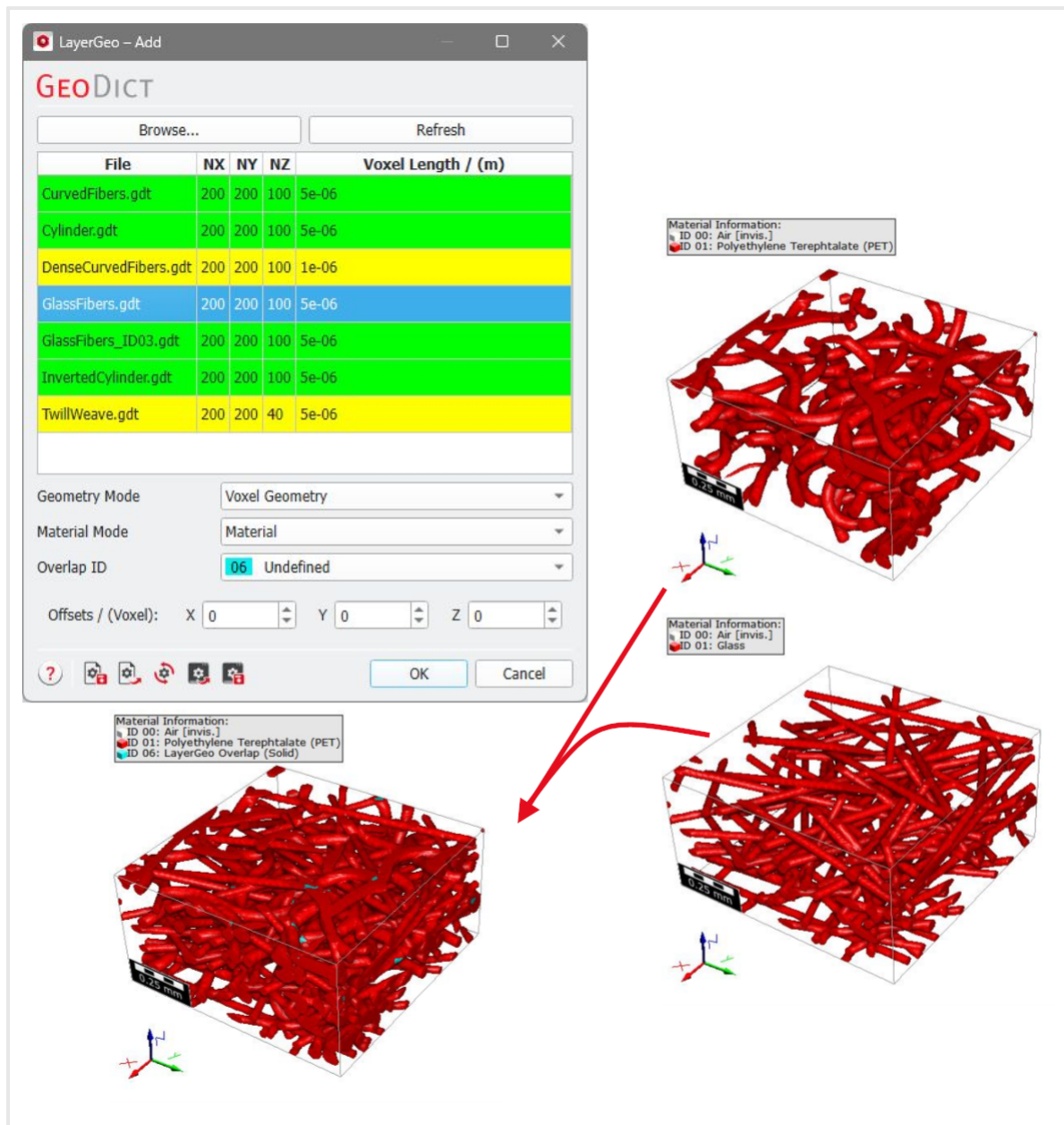


As seen for the **Attach**⁴ mode, the combined structure keeps the constituent material information from the original structure in case of the same Material IDs.

✓ Material Mode: Material

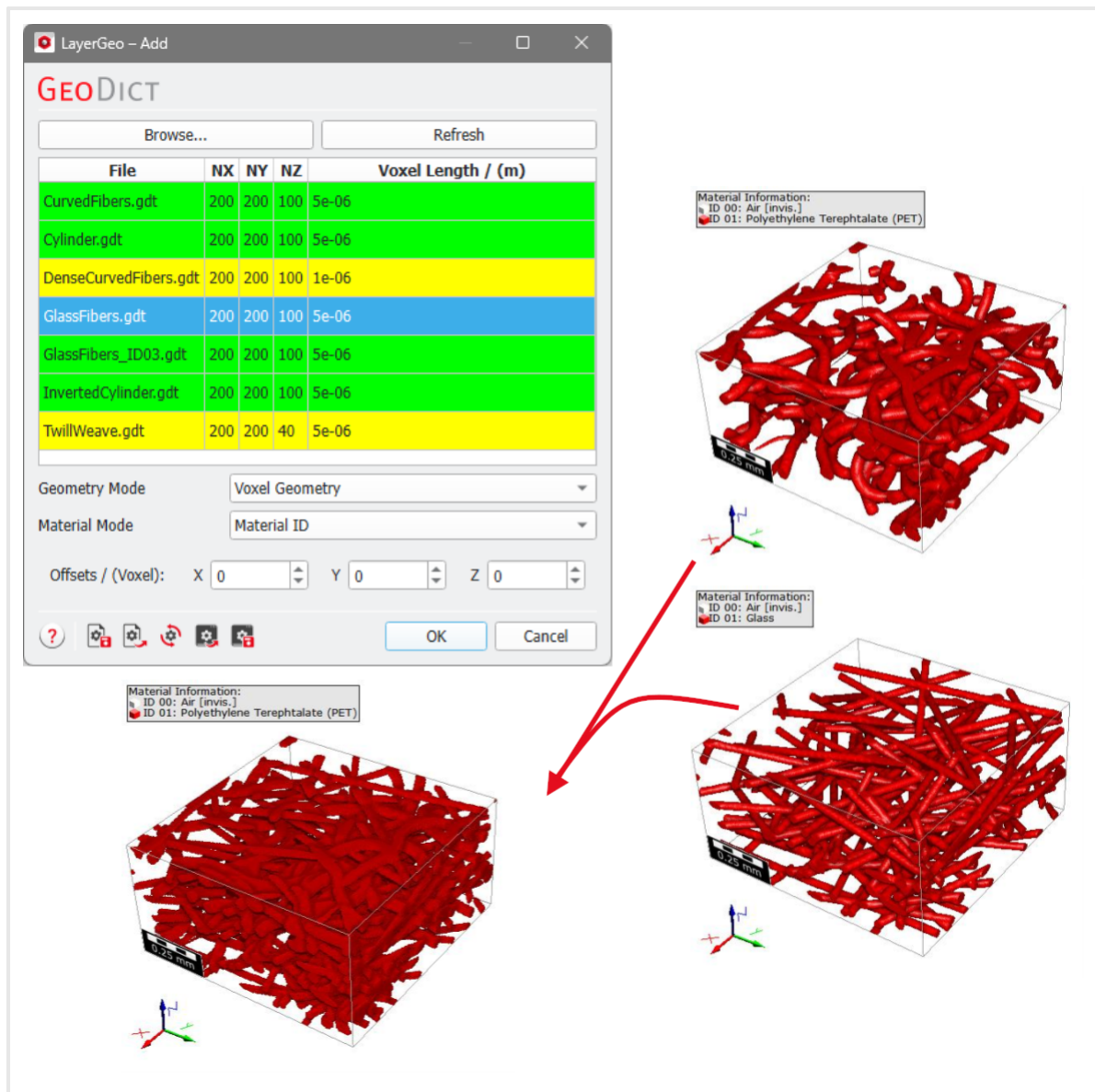
If **Material** is chosen, the Material ID of the overlap is defined through the given **Overlap ID**. Here, the Material ID 06 with the color cyan is chosen.





✓ Material Mode: Material ID

If **Material ID** is chosen, there is no choice of Overlap ID. Instead, the Material ID of the overlap is computed by a bitwise OR operation on the ID numbers. In this mode, adding ID 02 and ID 04 leads to ID 06 ($0010+0100=0110$) and adding ID 01 and ID 01 leads to ID 01 ($0001+0001=0001$). Thus, in the example from above, there is no separate Overlap Material ID, all solids have Material ID 01.

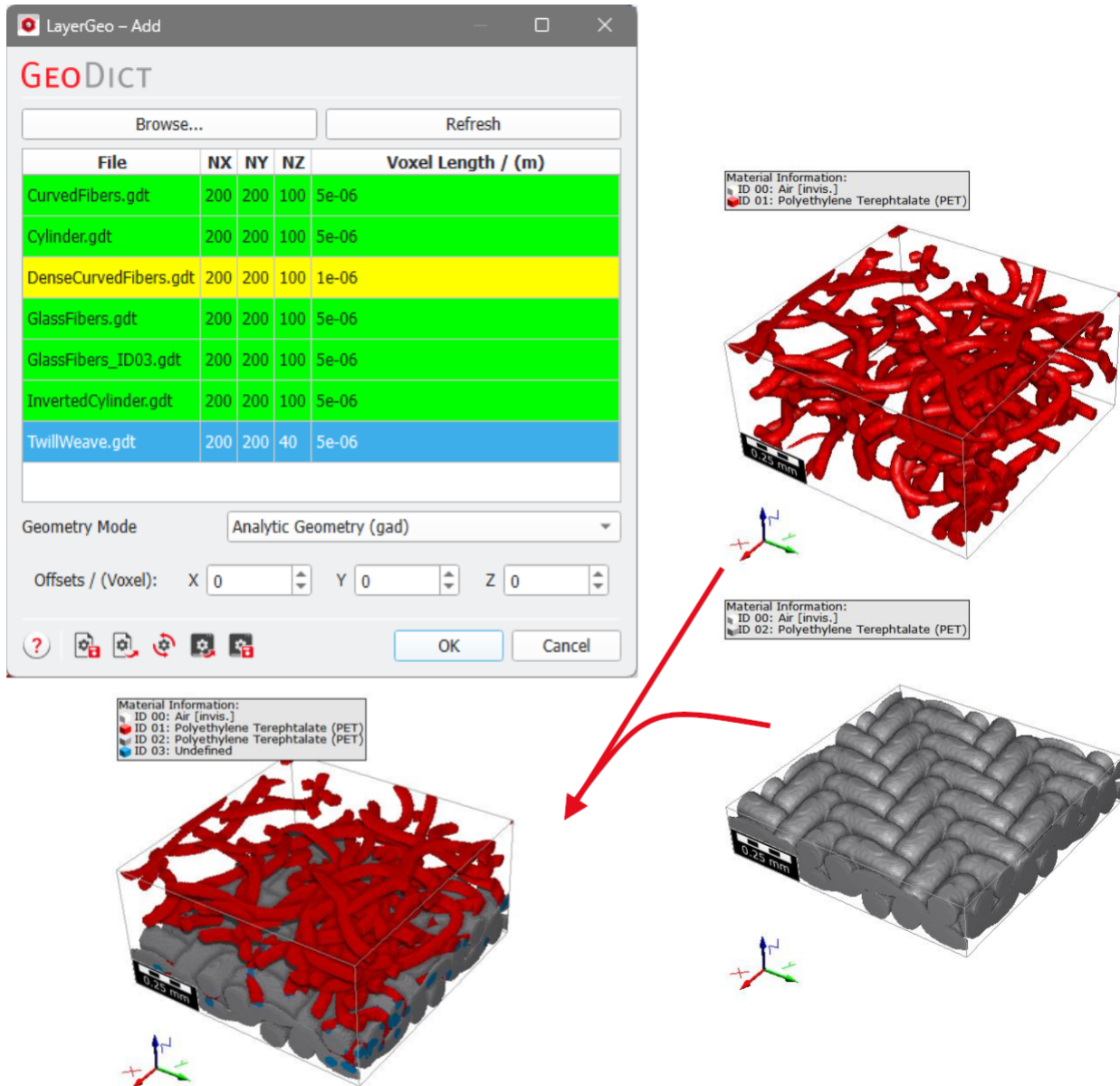


Know how! The color assigned to a Material ID can be changed later by selecting it through **Settings** → **Color & Visibility Settings** in the menu bar, its icon  in the toolbar, or the **Color & Visibility** tab at the right edge of the GeoDict GUI. The visibility of a Material ID can also be set in the **Color & Visibility Settings** dialog. For more details see the Visualization chapter.

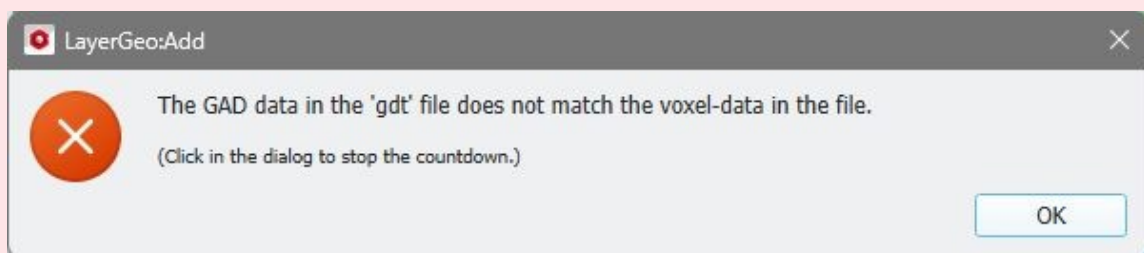
Analytic Geometry (gad)

If the loaded structure contains analytic data, the **Analytic Geometry (gad)** mode becomes available. Here, the analytic objects are added, and the overlap rules are defined by the

domain settings of the current structure (see [GadGeo - Edit Domain](#)). In the **Analytic Geometry** mode, the constituent materials from the currently loaded structure are used. This also holds if a Material ID appears in both structures.



Important! This works only when the files of both structures (the chosen file and the current structure) contain analytic information. If the structure to add does not contain analytic data and you click **Run**, an error message will appear.

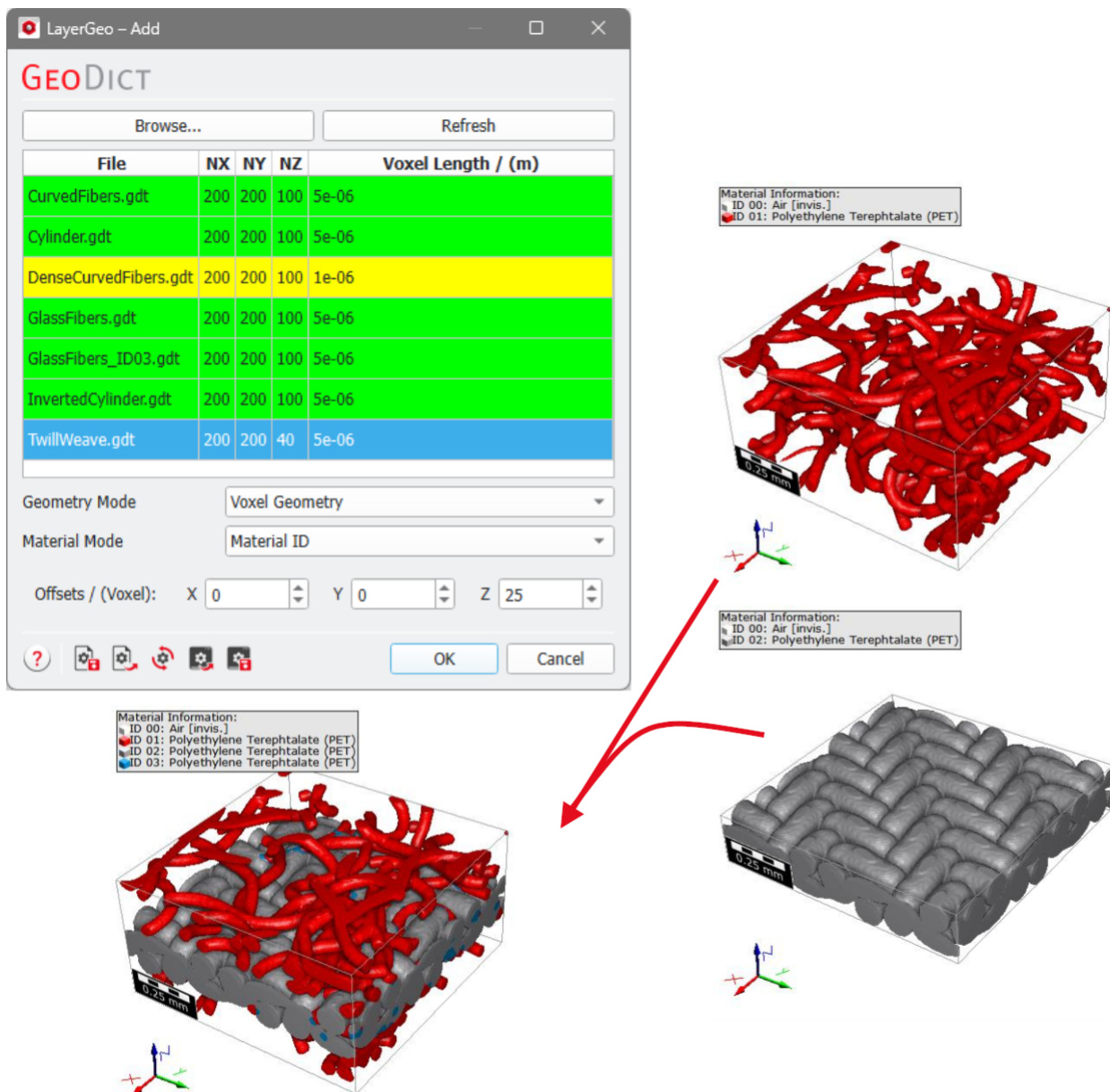


Offsets

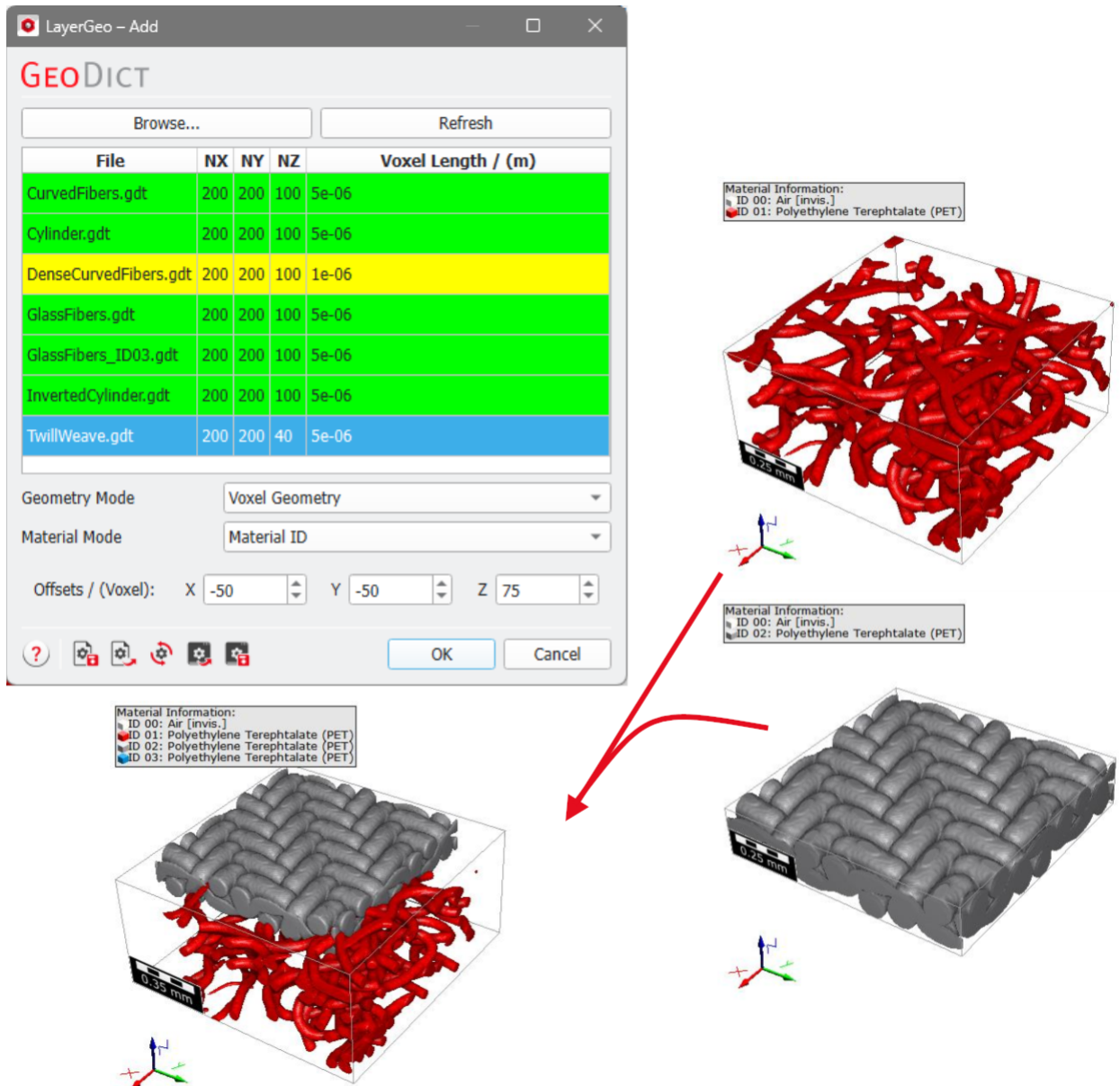
At the bottom of the dialog, you can define an offset for the position of the added structure. The default zero **Offsets** places the added structure starting at the (0, 0, 0) position of the original structure.

By setting non-zero **Offsets** in any of the three directions, a structure can be added to the original structure at any position in the given direction(s). If the offset forces the chosen structure to leave the domain of the current structure, the resulting structure will be enlarged.

For example, a woven mesh (TwillWeave.gdt) is added to the CurvedFibers.gdt (original structure) with an offset of 25 voxels in Z-direction and the **Material Mode MaterialID**. The combined structure shows the mesh embedded into the curved fibers.

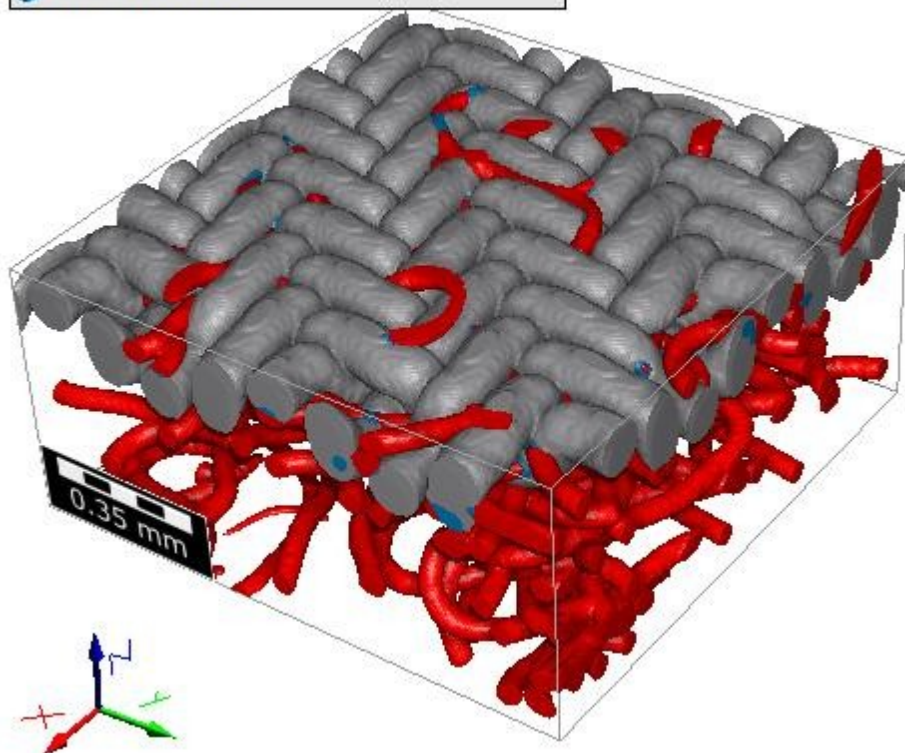


With offsets of -50, -50, and 75, the mesh appears in the combined structure as follows:



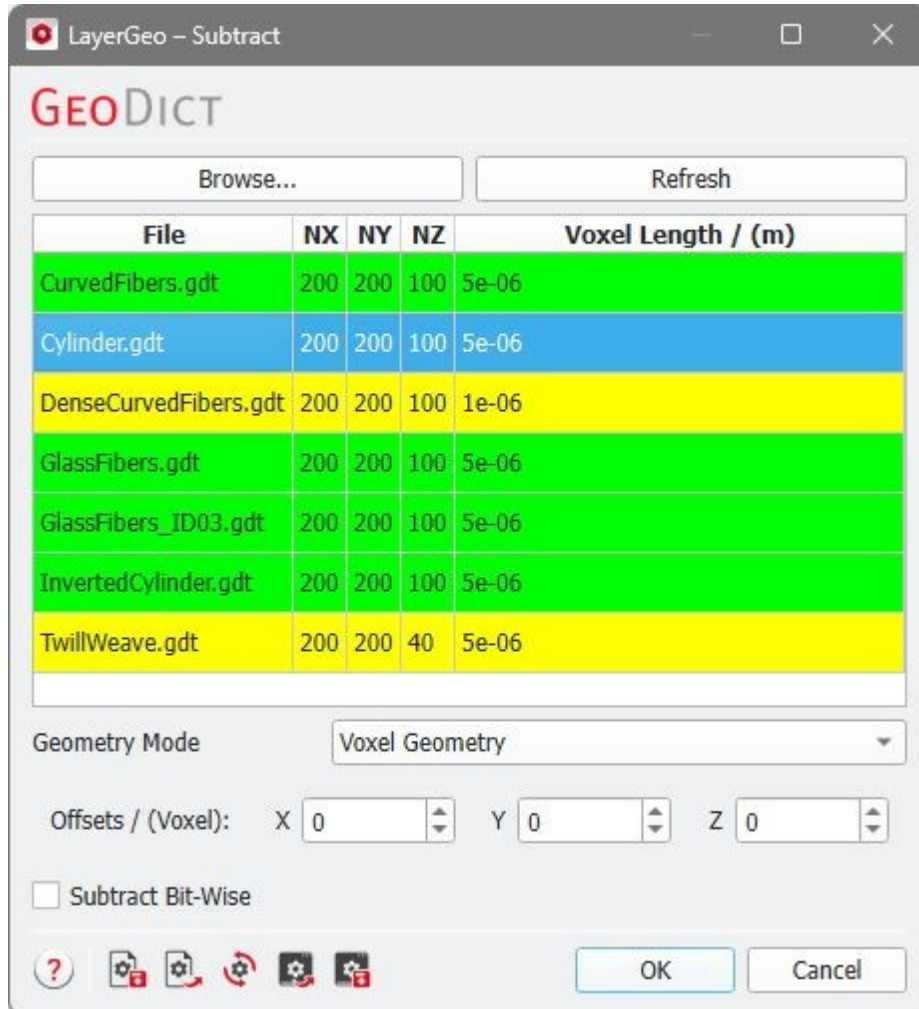
With the same settings as before, but with the Geometry Mode **Analytic Geometry** chosen, the glass fibers will be extended into the enlarged domain and the resulting structure will look like this:

Material Information:
ID 00: Air [invis.]
ID 01: Polyethylene Terephthalate (PET)
ID 02: Polyethylene Terephthalate (PET)
ID 03: Undefined



1.3 Subtract

The **Subtract** mode allows to remove parts of the original structure by subtracting a structure from it.



The options dialog shows a table with all files in GDT, GAD, and .leS formats present in the current project folder. To choose a project folder, select **File** → **Choose Project Folder** → **Select Project Folder...** in the menu bar beforehand. By clicking **Browse...**, you can also choose files from another directory. Clicking **Refresh** updates the table, e.g., after a new file is added to the currently selected folder.

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- **Yellow**: Names of files containing a structure whose dimensions match in only two directions, or do not have a matching voxel length.
- **Not highlighted**: Non-matching structures are not highlighted.

To select a structure, click on its name. The name of the selected structure is then highlighted in

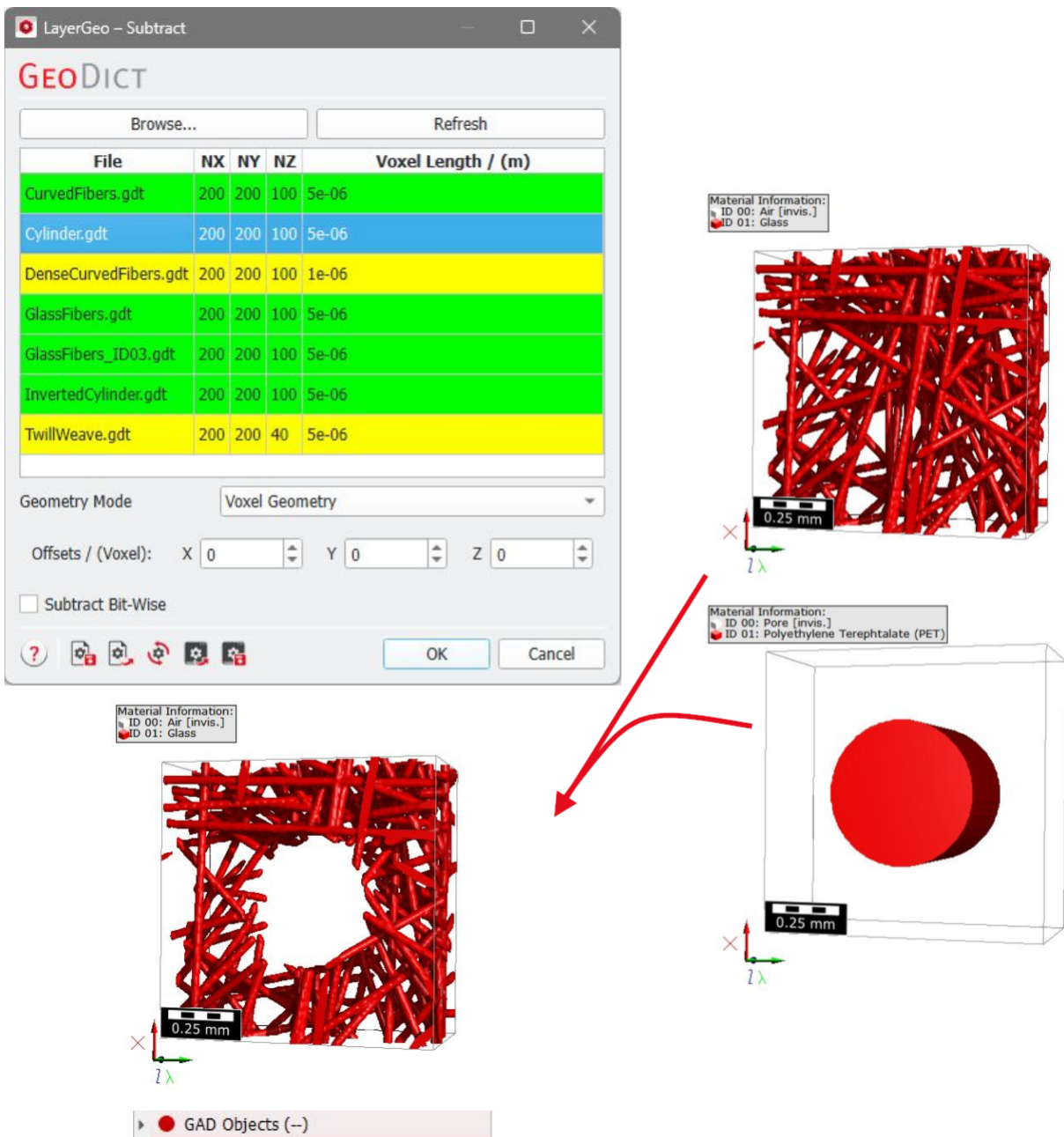
blue.

Below the table of the available structures, the choice of **Geometry Mode** defines if the analytic data or the voxel geometry is used. Additionally, you can define an **Offset** and the choice of **Subtract Bit-Wise** determines how the overlap Material IDs are determined.

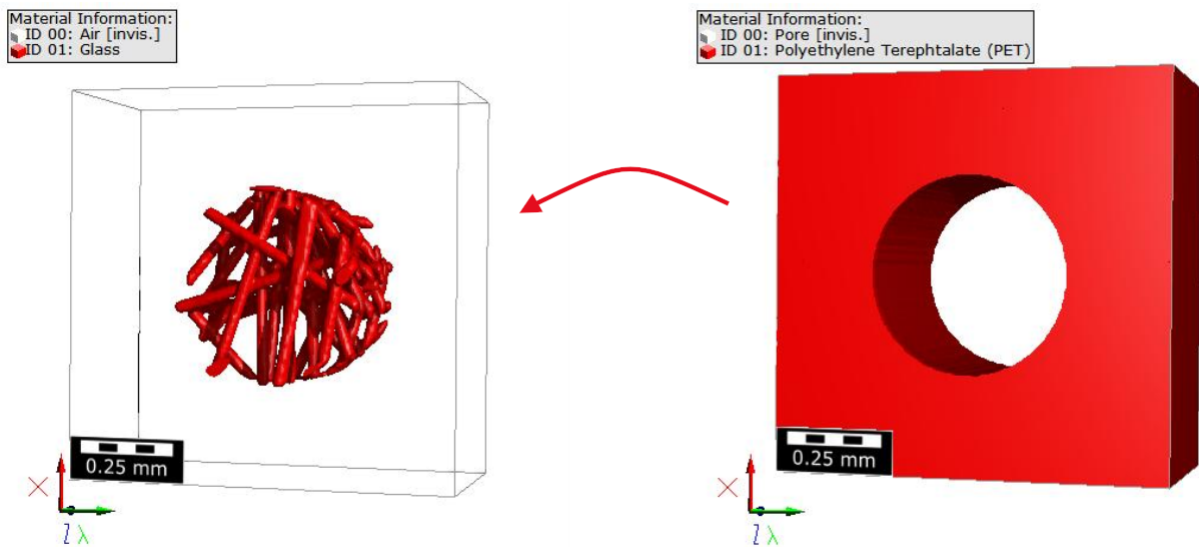
Voxel Geometry

If the Geometry Mode **Voxel Geometry** is chosen, the structures are subtracted based on the voxel information alone. If analytic data was present in the geometry files before, this data is discarded.

For example, a cylinder is used to remove a portion of the glass fibers, leaving a circular hole in the center of the resulting structure. As seen for the [Attach](#)₄ and the [Add](#)₁₂ modes, the combined structure uses the constituent material information of the original structure. With the default setting (Subtract Bit-Wise unchecked), the subtraction process sets all material overlap between the two structures to Material ID 00.



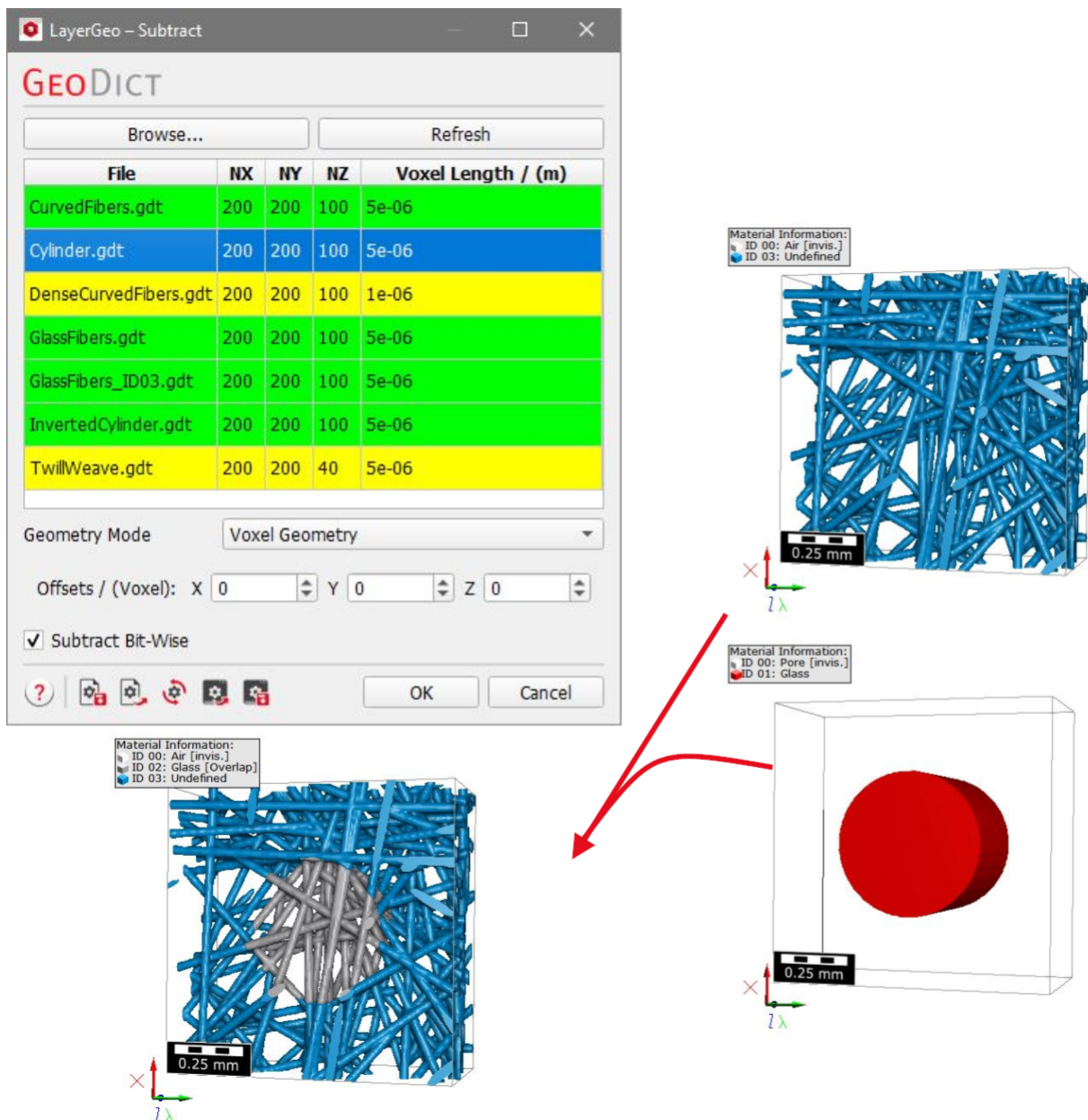
Or, in another case, a cylindrical hole (made by inverting the previous cylinder with ProcessGeo – Invert) is used to obtain a cylindrical portion at the center of the glass fibers structure.



Subtract Bit-Wise

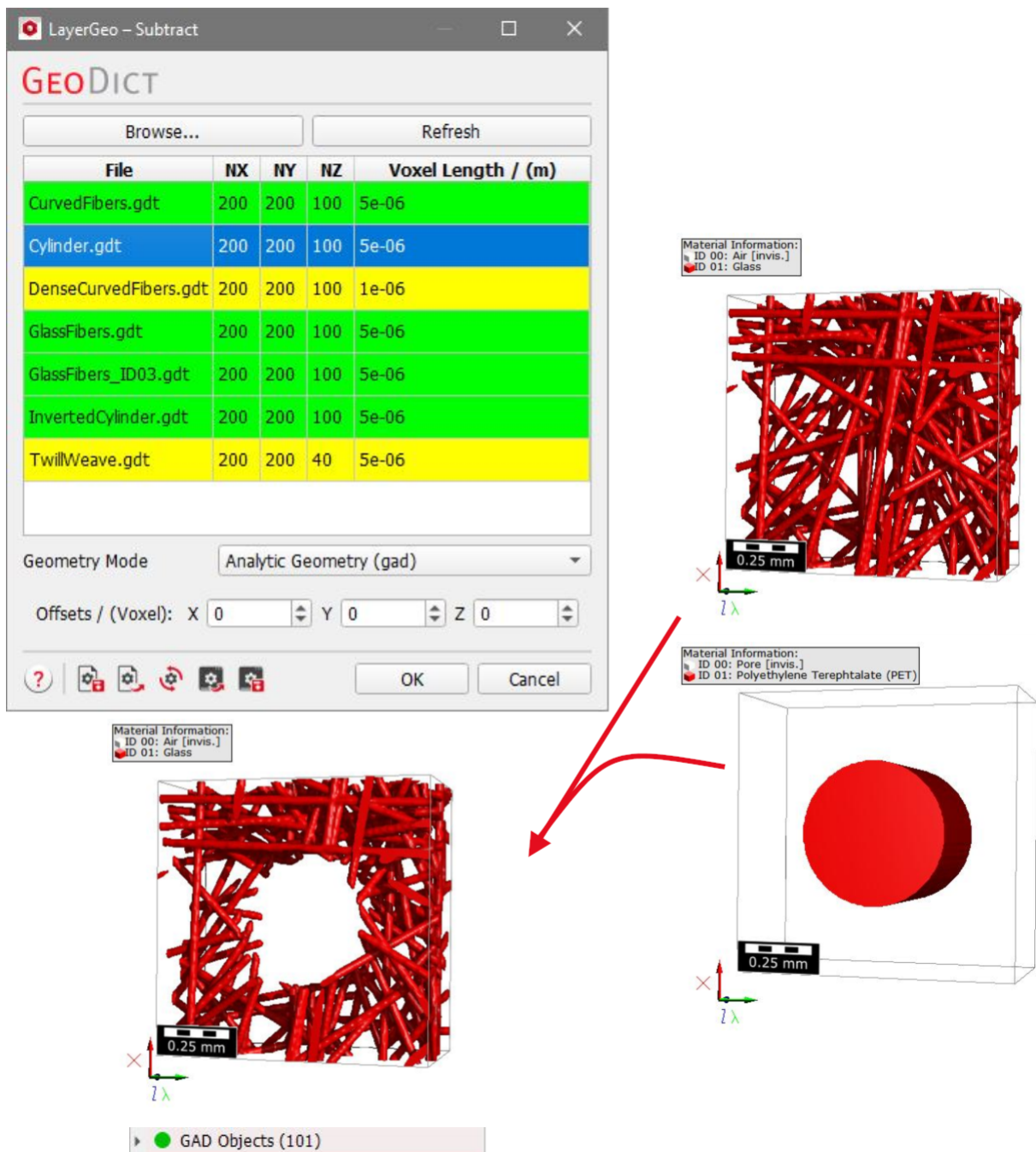
When **Subtract Bit-Wise** is checked, the Material IDs of the overlapping structure parts are determined by bit-wise subtracting the Material IDs.

For example, if we reassign the Material ID 01 to Material ID 03 in the GlassFibers.gdt structure (with ProcessGeo - Reassign Material ID) and subtract an object with Material ID 01 (Cylinder.gdt) with **Subtract Bit-Wise**, it does not produce the combined structure with Material ID 00 in the middle (since $0011-0001=0010$), which is Material ID 02.



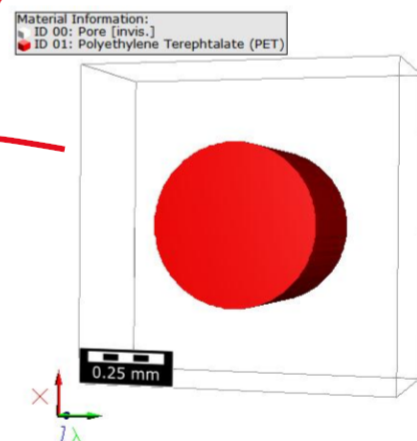
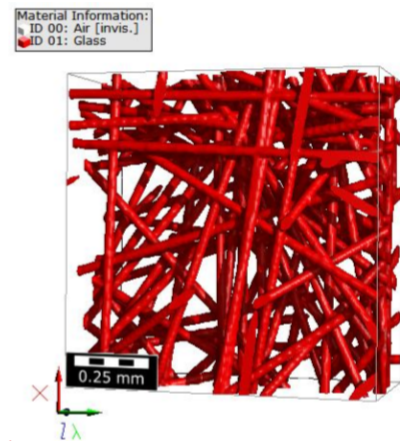
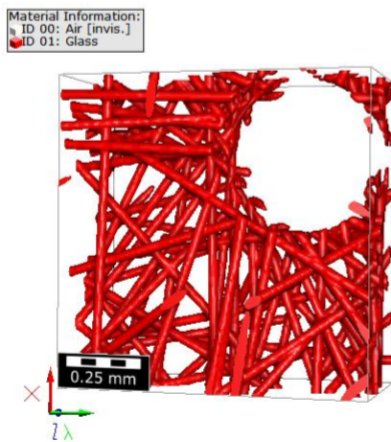
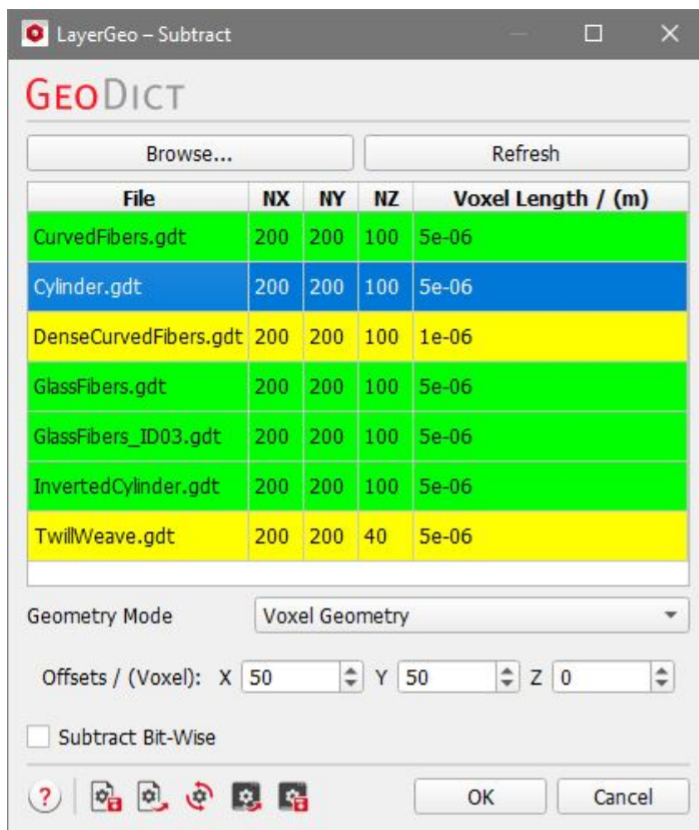
Analytic Geometry

If **Analytic Geometry (gad)** is chosen as Geometry Mode, the analytic objects are subtracted. Subtract Bit-Wise is not available, instead any overlap is set to Material ID 00. This works only when both structures (the chosen file and the current structure) have analytic information. The result is the same compared to the voxel method without subtracting bit-wise but the analytic information is preserved.



Offsets

As described, by setting **Offsets** different from 0, the structure can be subtracted at any location. For example, the cylinder from the first example is subtracted with an offset of 50 voxels in X direction and a Y offset of 50 voxels, such that the removal of glass fibers is not in the center and the hole appears closer to the corner.



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