**X-Ray Calc**

v. 2.4

**CREATING A MODEL**

**Tutorial**

This document briefly describes the creation of new models in X-Ray calc. The model represents a layered structure, which also could be periodical. The model consists of a substrate and at least one *Stack*. The Stack is the group of layers.

The following figure demonstrates the general structure of a model of a typical periodical X-Ray mirror.

Substrate

B

B

B

B

B

B

BN (0.3 - 1 nm)

SiNx (1 - 2 nm)

x N

Glass or PET

A

Bottom stack

Main stack

Top stack

The model above consists of three stacks – Top, Main, and Bottom. Top and Bottom stacks consists of single layers of materials A and B respectively. Main Stack consists of alternated layers of materials A and B. A/B pairs in Main Stack repeated N times.

A screenshot of a cell phone

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Commands on ***Stack*** and ***Layer*** panes could be used to manipulate elements of the structure. Some commands could be called from the right-click menu.

**Note: Editing of layers in the model**. To change the properties of any layer or Stack, double-click, or select the layer and press ***Enter***, or right-click and select ***Edit*** from the pop-up menu, or press *Ctrl+E*.

To create such a model in X-Ray calc, do the following steps:

1. A picture containing screenshot

   Description automatically generatedClick on the ***New Model*** button at ***Project items*** pane. The new model will be created. It contents only default substrate. Double-click on the Substrate layer and change the Material to SiO2 and set roughness to 0.3 nm. Because the default density of SiO2 will be used, leave the field ρ empty.
2. Add stacks. Click ***Add***on the pane ***Stack*.** In the dialog, enter the name of a new stack (“*Top*”). Repeat for stacks “Main” and “Bottom.”
3. A screenshot of a cell phone

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   Description automatically generatedSelect the top Stack. Click ***Add*** on the ***Layer*** panel. The new Si layer will be added to the Stack. Double click on the layer and change its properties as follows: Material – B; Thickness – 25; Roughens - 3; Density – empty. Click Ok.
4. A screenshot of a cell phone

   Description automatically generatedSelect the stack “Main.” Add Mo and B layers to the stack “Main” as follows:
5. Select the Mo layer. Click ***Copy*** on ***Layer*** pane. Then select the stack “Bottom” and click ***Paste*** on the ***Layer*** panel. Double-click on the Mo layer in the stack “Bottom” and increase its thickness to 100.
6. Double click on the stack “Main” and set *N* to *300*.

A screenshot of a cell phone

Description automatically generatedThe final structure looks as follows:

Press **F5** to immediately compute the GIXR curve for this model.