

*Thin Film Measurement solution Software, sensors, custom development and integration* 

## **CREATING PARAMETERIZED MATERIAL FOR Ge**

We will create a parameterized material to represent spectral dispersion (optical constants of Ge) and fit it to a measured data.

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15000nit_/800ox		Comments	
2.2Zn0_2.2_Al2O3_hete 🚨		commentLocation: [0.0 , 0.0 ]	
2000x_SiN_NiSi			
Al_lacquer Al_MoE2	Substrate: Ge (100).dat		
AlZnO_HEMT_IPT	Measured Data: Ge substrate.xls		
ARC_SPO	Data Table <sup>1</sup> Reflectance 1		
aSi_ASI aSi glassTest			
aSi_on_Glass_SP	Renectanc	e Fiol	
aSi_on_TCO_Glass	70- 68-		
aSiONO	66		
AuCdTe	₹ 62] • • • • • • • • • • • • • • • • • • •		
AuCrSi			
BK7 substrate	E 56		
Cambrios_LK_pr	0 54 0 52	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
CdS_on_CIGS_glass_rough			
	48		
🔿 Materials			
O Projects	250 300 350 400 450 500	550 600 650 700 750 800	
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Calculation Recipes			

Fig.1 Main screen after following steps are performed:

- a). Set Ge100.dat material as a substrate.
- b). Load Ge substrate measured data

c). Click "SimulateFit" button. (SimulateFit generarates a reflectance spectrum for a given filmstack – it does not do fitting). We use it to see how closely our reflectance data corresponds to a library material.

On the main screen, click on substrate - this will display Material dialog (Fig.2)

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**Fig. 2** Material dialog is displayed. In the Actions tree (left side bar), select Create Material/Oscillators/Harmonic Oscillator.

Select material type	×			
Please select a type of a meterial				
c-Si TiN Si5Ge(50:5	0)			

Fig. 3. Material selection dialog is displayed – select SiGe as a starting material.



Fig. 4 New material is created (we gave it name Ge\_Test).



**Fig. 5**. In the Actions tree, select Calculations/Show parameters – the check boxes next to parameters are displayed

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**Fig. 6** Check "Calculate" boxes next to all parameters and change number of oscillators from 4 to 3, change wavelength range to 200-1000nm. In Actions tree, select Calculate/Fit to Material. (Fig. 7 dialog is displayed)

Materia	Target	
P	Please select a Target Material To Fit To	
	GaPO.dat GaSb (Jellison).dat GaSbO.dat Gaas.mat Gaaso.mat Gap.mat Gash mat	
	Ge (100).dat Ge amorphous.dat Ge crystalline.dat OK Cancel	-

Fig. 7 Material selection dialog is displayed – we select Ge100 material to fit.

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**Fig. 8** Our new material dispersion is fitted to a Ge100 material. (You may need to repeat fit procedure few time to get a good curve fit). Click OK to close the dialog and return to the main screen



**Fig. 9** In the main screen click "Calculate". Material parameters are adjusted to fit the measured data. Click on substrate material to see the results of the n,k calculation. (Fig. 10).



Fig. 10. Results of the n,k calculation.

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Fig. 11. Now we can compare results with the database Ge100 material.(Fig 12)



Fig. 12. Measured material is compared to a database Ge100.dat material.