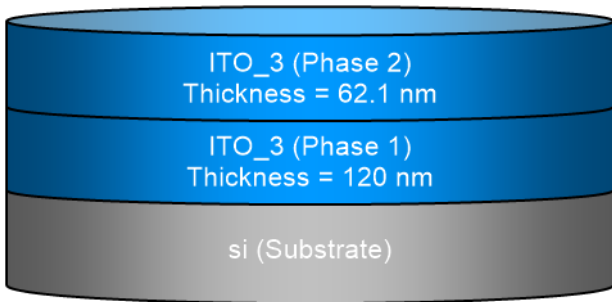


SEA regression report summary

Sample ID
001b-int-ii 70° 1
001b-int-ii 65° 2
001b-int-ii 60° 3

Details	
Software and regression log	
Software about	Semilab - Spectroscopic Ellipsometry Analyzer - SEA
Software version	1.7.1
Officially licensed to	MIT
Operator	operator
Date and time of regression	01-04-2022 14:27
Comments	

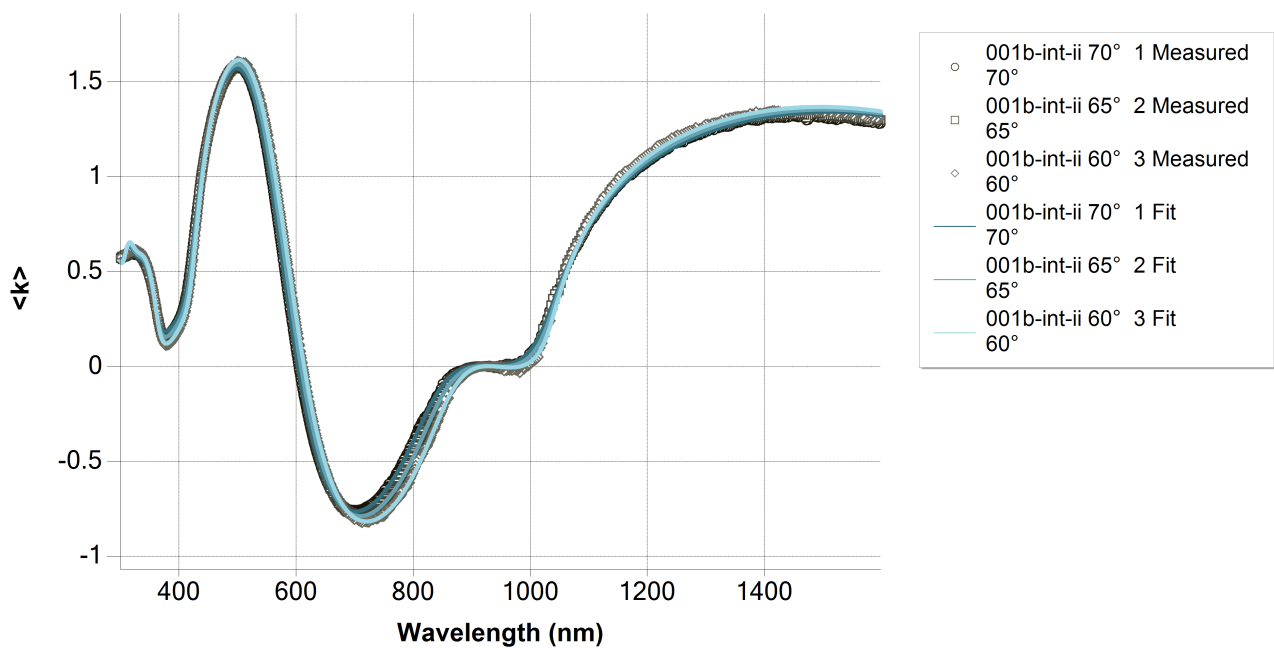
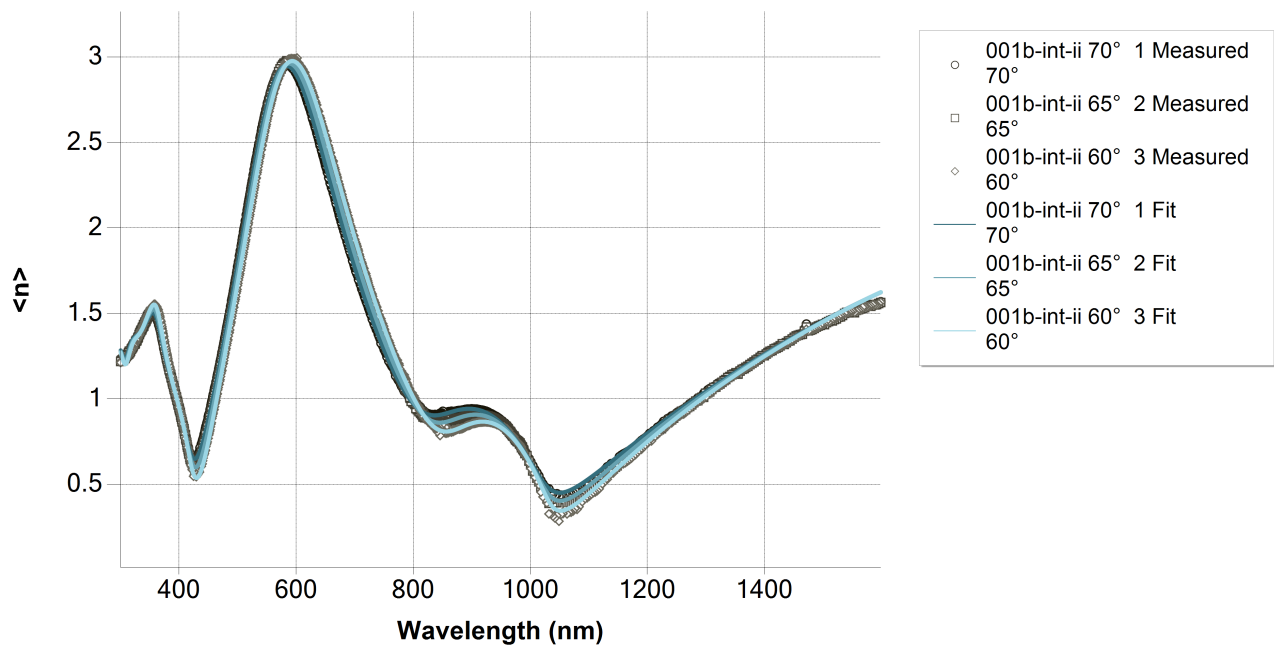
Layer structure	
Overview	
 <p>The diagram illustrates a three-layer structure. The top layer is labeled 'ITO_3 (Phase 2)' with a thickness of 62.1 nm. The middle layer is labeled 'ITO_3 (Phase 1)' with a thickness of 120 nm. The bottom layer is labeled 'si (Substrate)'.</p>	
Optical model	
Phase 2	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz
Phase 1	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz

Regression results

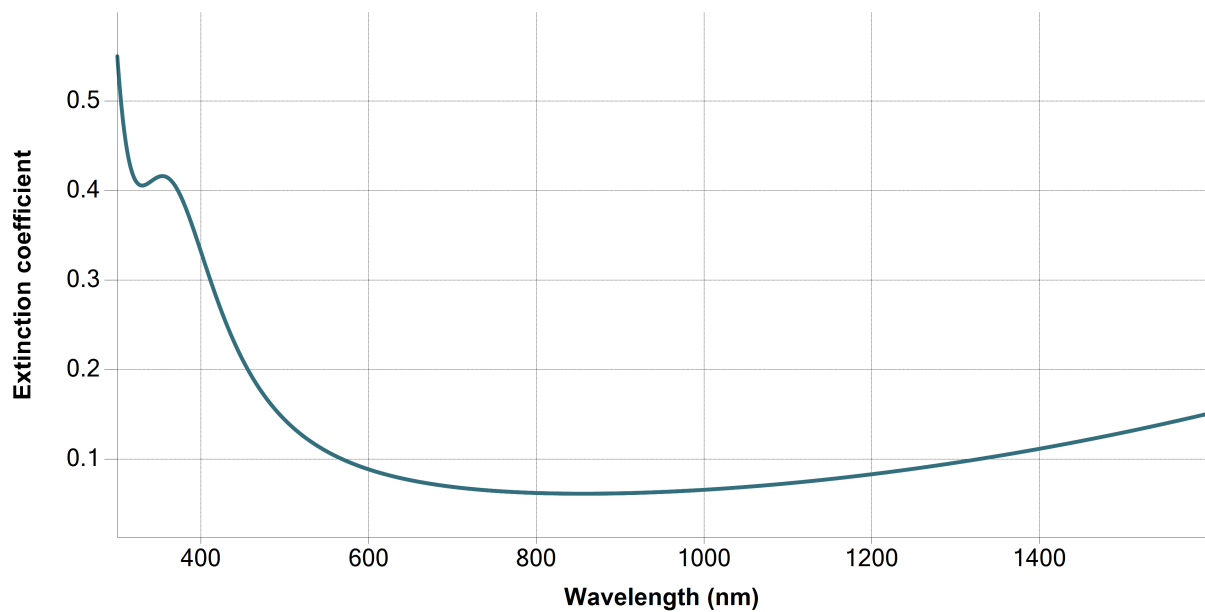
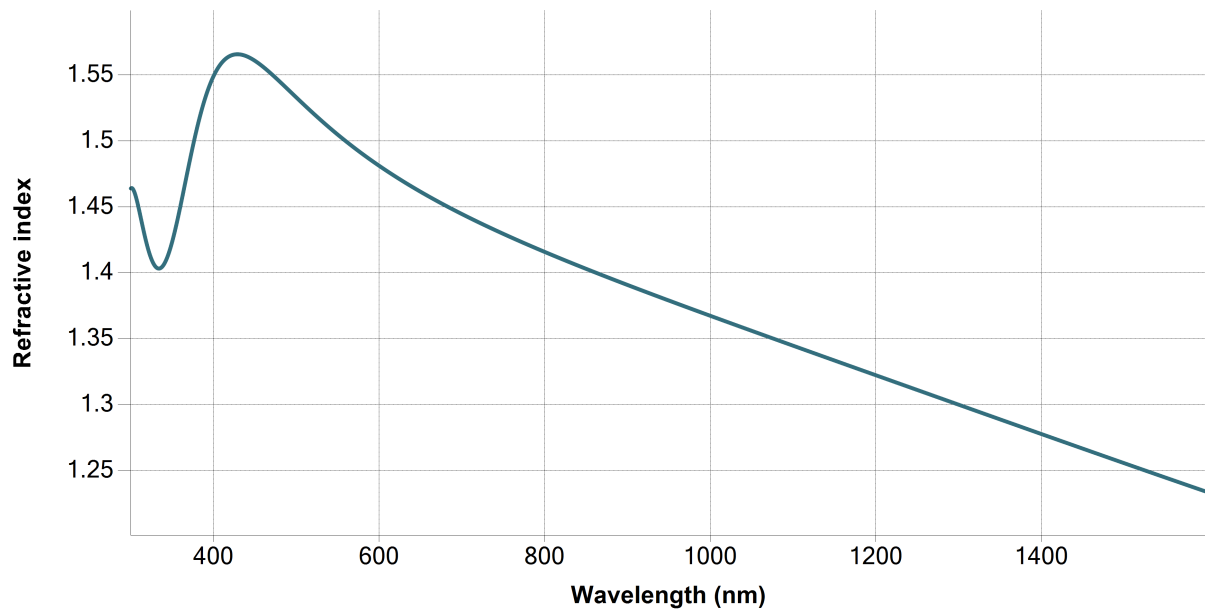
Measurement information				
Measurement 1				
Measurement file path	C:\Users\emmabat\ito-si\001b-int-ii.smdx			
Angle of Incidence	70°			
Measurement 2				
Measurement file path	C:\Users\emmabat\ito-si\001b-int-ii.smdx			
Angle of Incidence	65°			
Measurement 3				
Measurement file path	C:\Users\emmabat\ito-si\001b-int-ii.smdx			
Angle of Incidence	60°			
Regression details				
Regression 1 (EllipsoReflectance)				
Wavelength range	300.14 - 1599.16 nm			
Angle of Incidence	70°			
Fit to	<n>, <k>			
Regression 2 (EllipsoReflectance)				
Wavelength range	300.14 - 1599.16 nm			
Angle of Incidence	65°			
Fit to	<n>, <k>			
Regression 3 (EllipsoReflectance)				
Wavelength range	300.14 - 1599.16 nm			
Angle of Incidence	60°			
Fit to	<n>, <k>			
Angular Aperture	0°			
Fit algorithm	LMA			
Results				
Parameters	Value	Fitted	2 σ confidence limit	Unit
Model				
AOI Shift	0			°
Angular Aperture	0			°
Phase 2 (ITO_3)				
Thickness	62.073	X	0.05859	nm
f	0.39879	X	0.0059444	
E0 (eV)	3.40036	X	0.0063217	eV
Γ (eV)	1.33809	X	0.0080828	eV
E_p (eV)	0.67883	X	0.0033194	eV
E_Γ (eV)	0.42657	X	0.0058227	eV
f	0.26607	X	0.010389	
E0 (eV)	4.37218	X	0.011433	eV
Γ (eV)	0.66509	X	0.02903	eV
Eps_inf	1.39699	X	0.0095626	
Phase 1 (ITO_3)				
Thickness	119.981	X	0.080352	nm
f	0.16357			
E0 (eV)	3.74618			eV

Γ (eV)	0.62015			eV
E_p (eV)	1.09856			eV
E_ Γ (eV)	0.22823			eV
f	0.43808			
E0 (eV)	4.29829			eV
Γ (eV)	0.24163			eV
Eps_inf	3.4998			
Derived parameters	Value			
Phase 2 (ITO_3)				
n @ 632.8 nm	1.4679			
k @ 632.8 nm	0.08			
Phase 1 (ITO_3)				
n @ 632.8 nm	1.9911			
k @ 632.8 nm	0.0202			
Substrate (si)				
n @ 632.8 nm	3.8811			
k @ 632.8 nm	0.0195			
Drude derived parameters	Value			Unit
Phase 2 (ITO_3)				
Conductivity (S/m)	1.4532E+04 \pm 340.4756			S/m
Resistivity (m Ω .cm)	6.8815 \pm 0.1612			m Ω .cm
Resistance (Ω /sq)	1108.6198 \pm 27.0212			Ω /sq
N type dopant concentration (at/cm3)	8.3551E+19 \pm 8.1712E+17			at/cm3
P type dopant concentration (at/cm3)	1.2366E+20 \pm 1.2093E+18			at/cm3
N type dopant mobility (cm2/Vs)	10.8556 \pm 0.2756			cm2/Vs
P type dopant mobility (cm2/Vs)	7.3349 \pm 0.1862			cm2/Vs
Phase 1 (ITO_3)				
Conductivity (S/m)	7.1131E+04 \pm 0			S/m
Resistivity (m Ω .cm)	1.4058 \pm 0			m Ω .cm
Resistance (Ω /sq)	117.1731 \pm 0.0785			Ω /sq
N type dopant concentration (at/cm3)	2.1881E+20 \pm 0			at/cm3
P type dopant concentration (at/cm3)	3.2384E+20 \pm 0			at/cm3
N type dopant mobility (cm2/Vs)	20.2898 \pm 0			cm2/Vs
P type dopant mobility (cm2/Vs)	13.7093 \pm 0			cm2/Vs
Fit quality				
R^2	0.99966			
RMSE	0.01344			

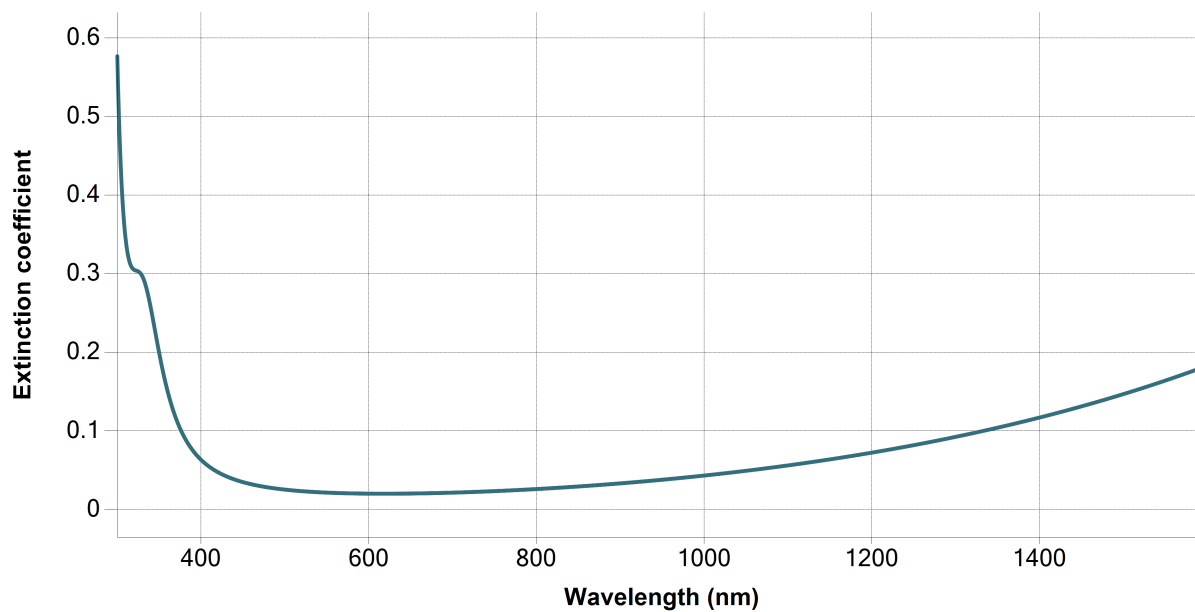
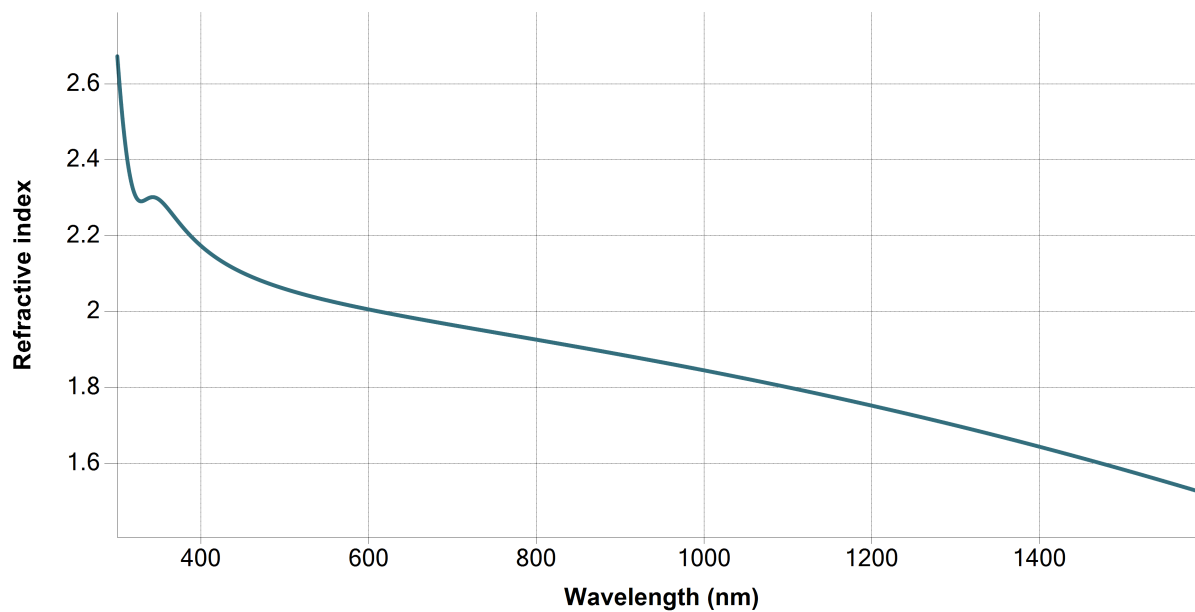
Regression graphs



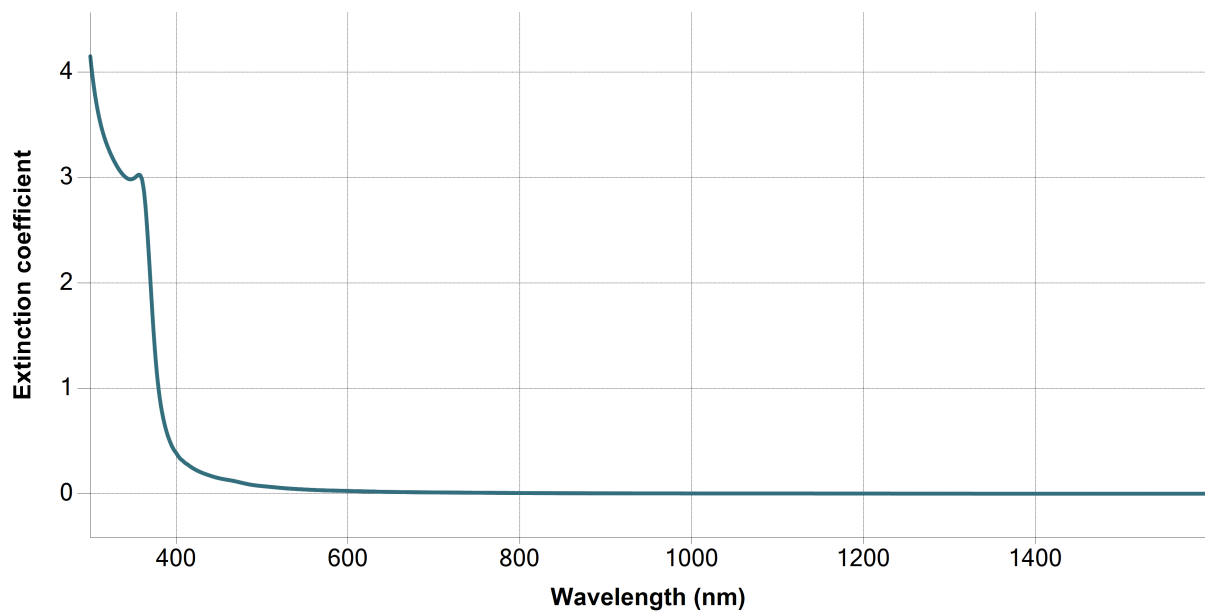
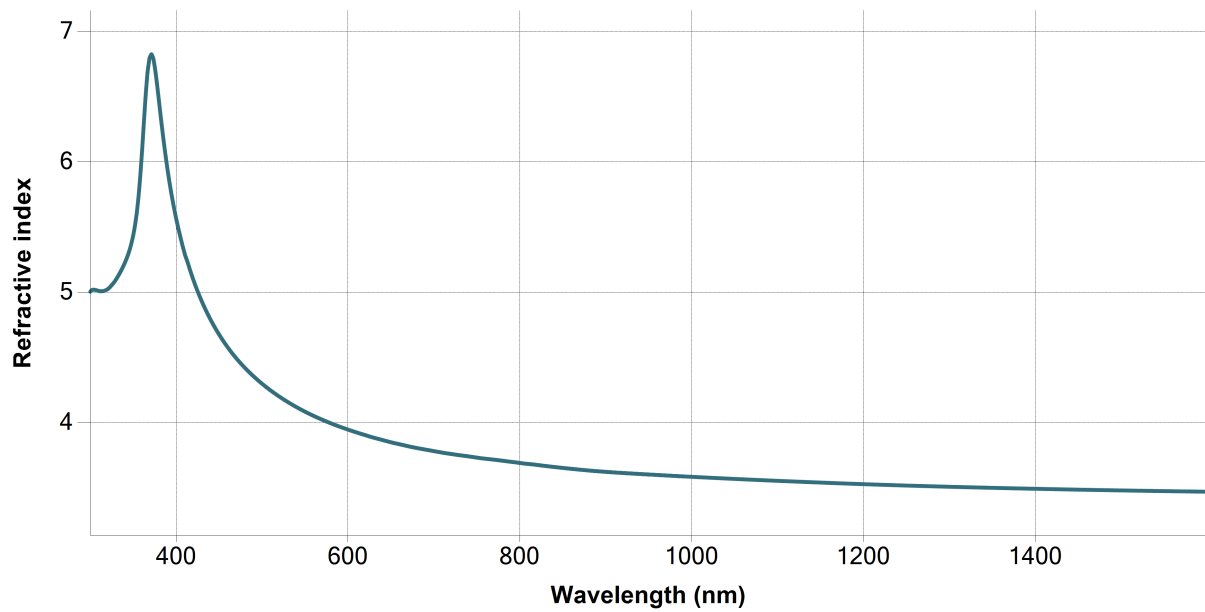
Phase 2 (ITO_3) - Dispersion graphs



Phase 1 (ITO_3) - Dispersion graphs



Substrate (si) - Dispersion graphs



Correlation coefficients	
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - f	0.3148
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - E0 (eV)	0.3111
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - Γ (eV)	0.2905
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_p (eV)	0.2268
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_ Γ (eV)	-0.0792
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - f	-0.3712
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - E0 (eV)	-0.3606
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - Γ (eV)	-0.2508
Ph2 - ITO_3 - Thickness --- Ph2 - Eps_inf	0.4291
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - E0 (eV)	0.9562
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - Γ (eV)	0.8551
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_p (eV)	0.5192
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_ Γ (eV)	-0.3761
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - f	-0.9342
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - E0 (eV)	-0.7589
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - Γ (eV)	-0.9335
Ph2 - Lorentz[1] - f --- Ph2 - Eps_inf	0.7504
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[1] - Γ (eV)	0.8933
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_p (eV)	0.452
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_ Γ (eV)	-0.3737
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - f	-0.8586
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.6461
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.8378
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Eps_inf	0.6653
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_p (eV)	0.4105
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_ Γ (eV)	-0.4966
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - f	-0.717
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.5357
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.6989
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Eps_inf	0.556
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Drude[2] - E_ Γ (eV)	-0.2486
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - f	-0.6105
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.5397
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.4716
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Eps_inf	0.8184
Ph2 - Drude[2] - E_ Γ (eV) --- Ph2 - Lorentz[3] - f	0.2977
Ph2 - Drude[2] - E_ Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	0.1946
Ph2 - Drude[2] - E_ Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.2439
Ph2 - Drude[2] - E_ Γ (eV) --- Ph2 - Eps_inf	-0.3078
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - E0 (eV)	0.9061
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - Γ (eV)	0.9438
Ph2 - Lorentz[3] - f --- Ph2 - Eps_inf	-0.8877
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.8541
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Eps_inf	-0.8326
Ph2 - Lorentz[3] - Γ (eV) --- Ph2 - Eps_inf	-0.7367

