Ragula Bhoopal

20ETMM11

Group-2

Nitride film 1 **MT-455**

Aim: To determine crystallite size and lattice strain for the given data.

Procedure:

Given the instrumental broadening value, $\mathbf{B_i} = 0.045^{o}$

Gaussian equation $\mathbf{B_R^2 = B_O^2 - B_i^2}$

$\mathbf{B_R Cos\theta} = \frac{\mathbf{k\lambda}}{\mathbf{L}} + \eta \mathbf{Sin\theta}$ where, $\eta = S$train in the material

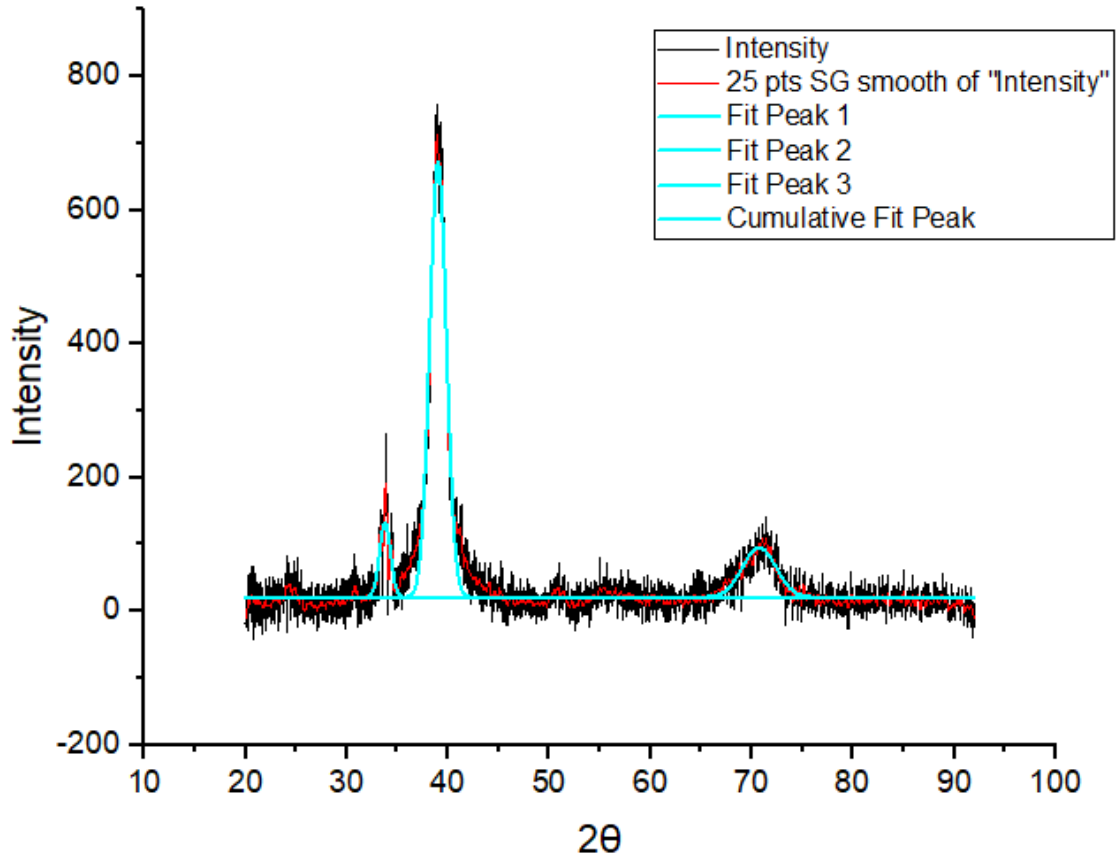
L= Crystallite Size

k=0.94

$\lambda = 0.154$nm

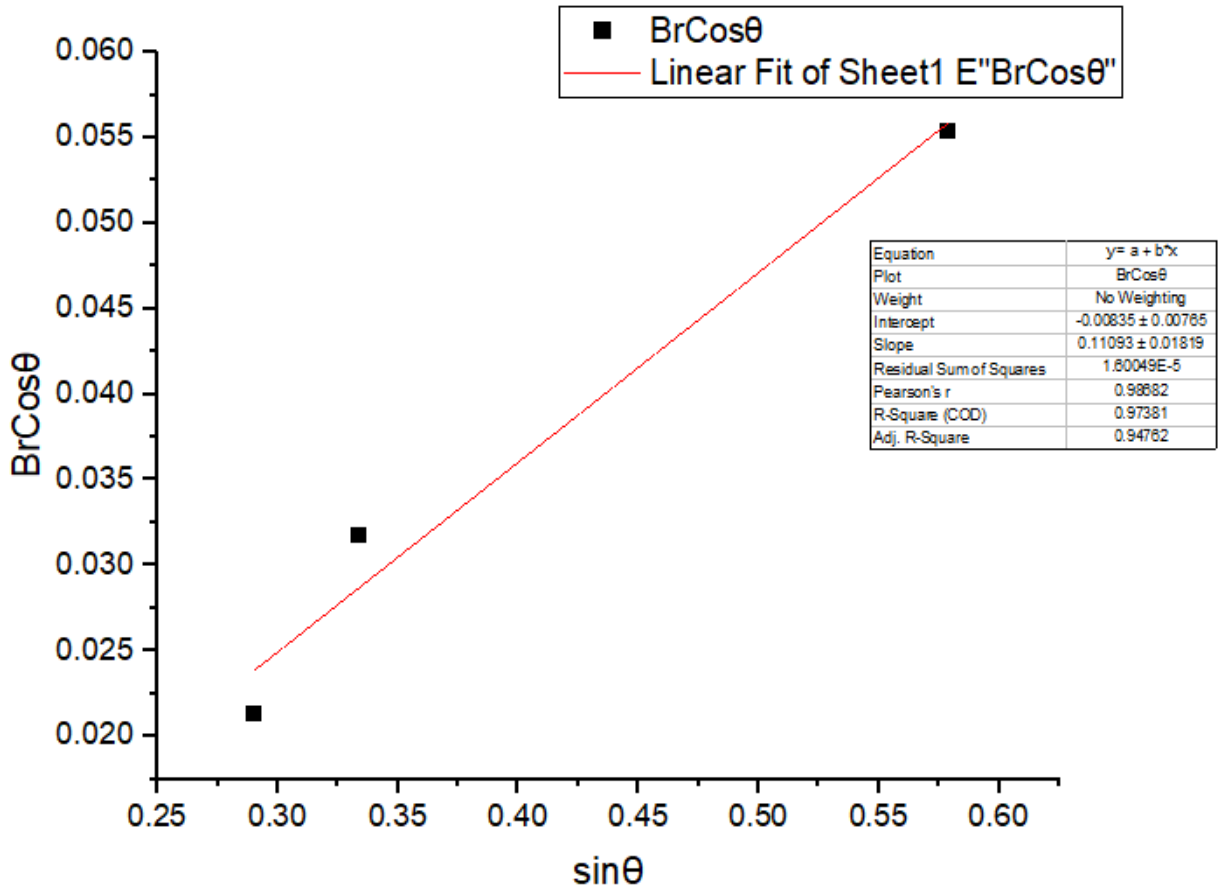
Comparing the above equation with $y = bx + a$ Where, $b = \text{Slope} = \eta$

$a = \text{Intercept} = \frac{\mathbf{k\lambda}}{\mathbf{L}}$



2θ	θ(rad)	B_o(fwhm)	B_o(rad)	B_o^2	B_i(deg)	B_i(rad)	B_i^2
33.76656	0.294669	1.27552	0.022262	0.000496	0.045	0.000785	6.17E-07
39.00728	0.340403	1.928	0.03365	0.001132	0.045	0.000785	6.17E-07
70.73872	0.617312	3.89281	0.067942	0.004616	0.045	0.000785	6.17E-07

$B_r^2=B_o^2-B_i^2$	B_r	$B_r\cos\theta$	sinθ
0.000495	0.022248	0.021289	0.290423
0.001132	0.033641	0.03171	0.333867
0.004616	0.067938	0.055399	0.578845



Equation	y = a + b*x
Plot	BrCosθ
Weight	No Weighting
Intercept	-0.00835 ± 0.00765
Slope	0.11092 ± 0.01819
Residual Sum of Squares	1.6005E-5
Pearson's r	0.98682
R-Square (COD)	0.97381
Adj. R-Square	0.94762

$$\mathrm{b} = \mathrm{Slope} = \eta$$
$$\mathbf{a} = \mathrm{Intercept} = \frac{\mathbf{k}\lambda}{\mathbf{L}}$$
$$\mathrm{Therefore}, \eta = 0.11092$$
$$\frac{\mathbf{k}\boldsymbol{\lambda}}{\mathbf{L}} = 0.00835$$
$$\mathbf{L} = \frac{\mathbf{k}\lambda}{0.00835}$$
$$\mathbf{L} = \frac{0.94 \times 0.154}{0.00835}$$
$$\mathbf{L} = 17.3365 \text{ nm}$$

Result

$\eta = S$train in the material=0.11092
L= Crystallite Size $= 17.3365$ nm