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20ETMM11

Group-2

Nitride film 3 **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 $\mathbf{B_R^2} = \mathbf{B_O^2} - \mathbf{B_i^2}$

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

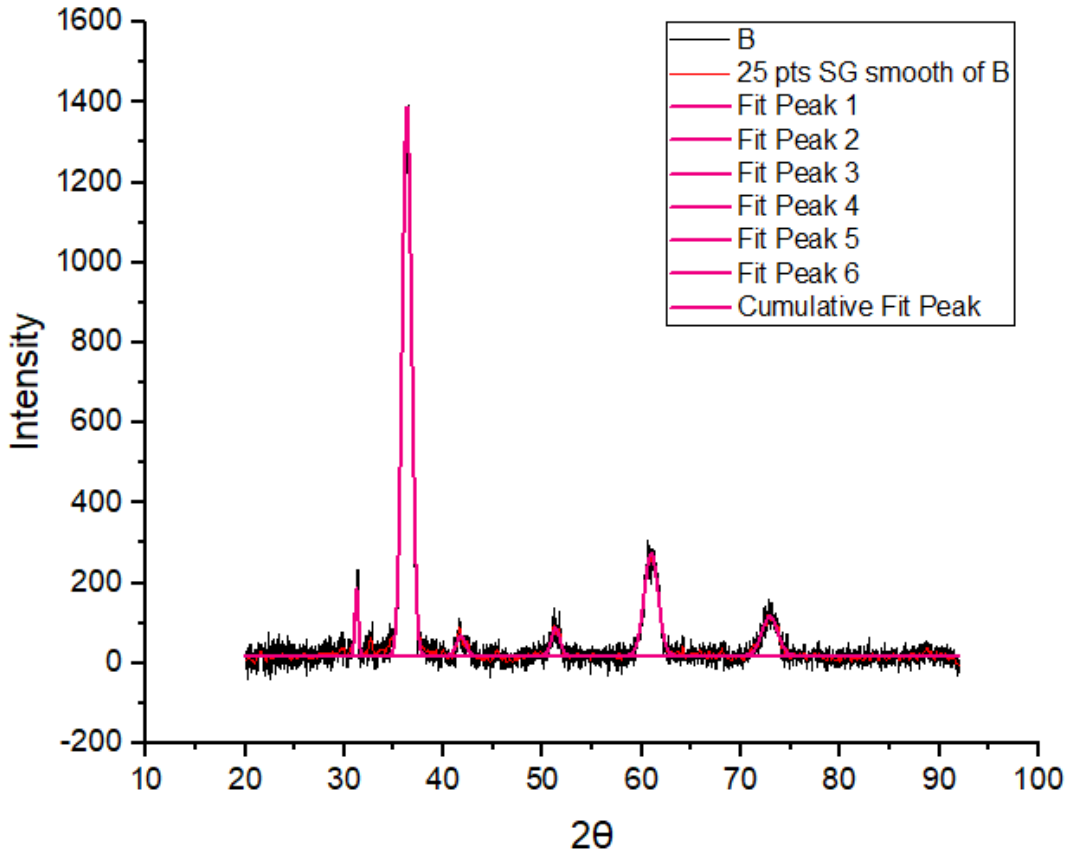
L= Crystallite Size

k=0.94

$\lambda = 0.154$nm

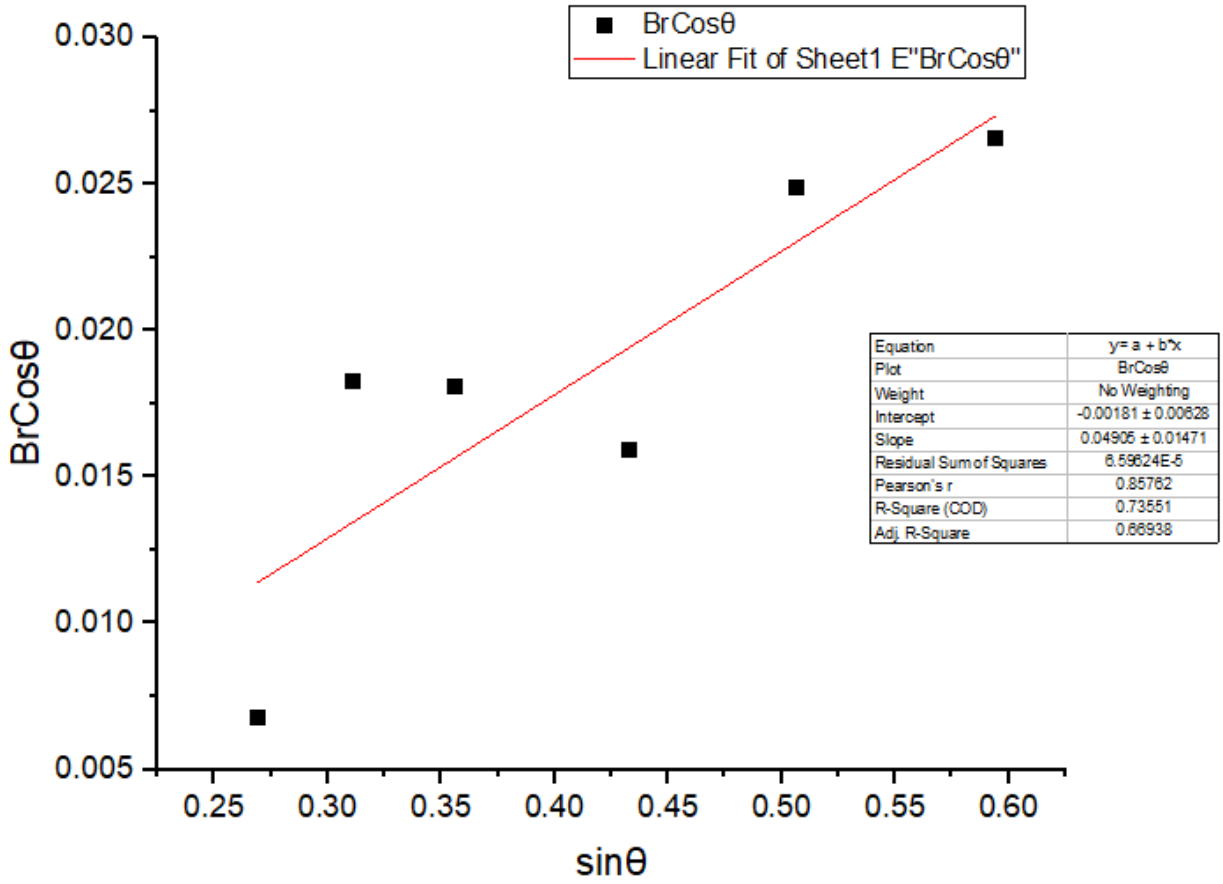
Comparing the above equation with $y = bx + a$ Where, $b = \text{Slope} = \eta$

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



2θ	θ(rad)	B_o(fwhm)	B_o(rad)	B_o^2	B_i(deg)	B_i(rad)	B_i^2
31.23024	0.272535	0.40573	0.007081	5.01E-05	0.045	0.000785	6.17E-07
36.29897	0.316768	1.10047	0.019207	0.000369	0.045	0.000785	6.17E-07
41.76266	0.364448	1.10718	0.019324	0.000373	0.045	0.000785	6.17E-07
51.3042	0.447714	1.01079	0.017642	0.000311	0.045	0.000785	6.17E-07
60.93761	0.531781	1.65249	0.028841	0.000832	0.045	0.000785	6.17E-07
72.90834	0.636245	1.89106	0.033005	0.001089	0.045	0.000785	6.17E-07

$B_r^2=B_o^2-B_i^2$	B_r	$B_r\cos\theta$	sinθ
4.95E-05	0.007038	0.006778	0.269174
0.000368	0.019191	0.018236	0.311497
0.000373	0.019308	0.01804	0.356434
0.000311	0.017624	0.015887	0.432906
0.000831	0.028831	0.024849	0.507069
0.001089	0.032996	0.02654	0.59418



Equation	y = a + b*x
Plot	BrCosθ
Weight	No Weighting
Intercept	-0.00181 ± 0.00628
Slope	0.04905 ± 0.01471
Residual Sum of Squares	6.59624E-5
Pearson's r	0.85762
R-Square (COD)	0.73551
Adj. R-Square	0.66938

$$\mathrm{b} = \mathrm{Slope} = \eta$$
$$\mathbf{a} = \mathrm{Intercept} = \frac{\mathbf{k}\lambda}{\mathbf{L}}$$
$$\mathrm{Therefore}, \eta = 0.04905$$
$$\frac{\mathbf{k}\boldsymbol{\lambda}}{\mathbf{L}} = 0.00447$$
$$\mathbf{L} = \frac{\mathbf{k}\lambda}{0.00447}$$
$$\mathbf{L} = \frac{0.94 \times 0.154}{0.00447}$$
$$\mathbf{L} = 32.3847 \text{ nm}$$

Result

$\eta = S$train in the material=0.04905
L= Crystallite Size $= 32.3847$ nm