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20ETMM11
Group-2

Nitride film 2 **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

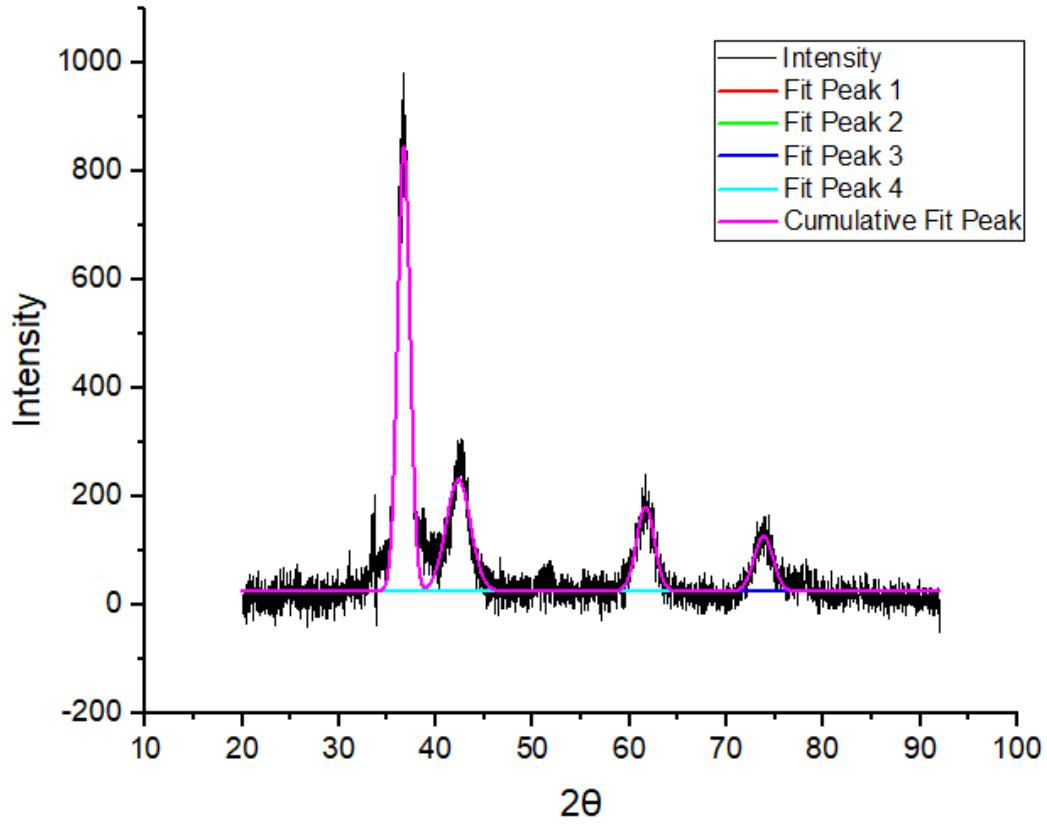
L= Crystallite Size

k=0.94

$\lambda = 0.154$nm

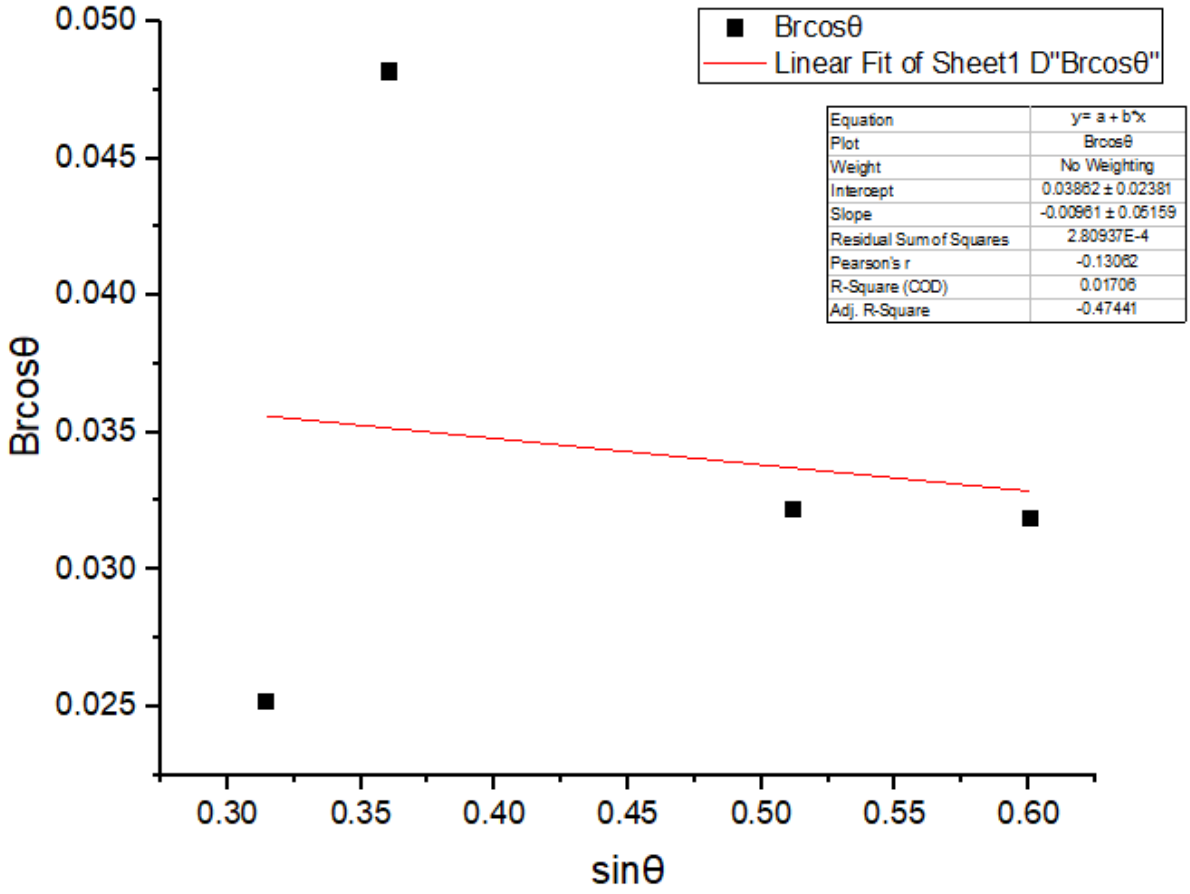
Comparing the above equation with $y = bx + a$ Where, $b = \text{Slope} = \eta$

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



2θ	θ(rad)	B_o(fwhm)	B_o(rad)	B_o^2	B_i(deg)	B_i(rad)	B_i^2
36.67767	0.320073	1.52066	0.026541	0.000704	0.045	0.000785	6.17E-07
42.30679	0.369196	2.95861	0.051637	0.002666	0.045	0.000785	6.17E-07
61.62263	0.537759	2.14505	0.037438	0.001402	0.045	0.000785	6.17E-07
73.8236	0.644232	2.28072	0.039806	0.001585	0.045	0.000785	6.17E-07

$B_r^2=B_o^2-B_i^2$	B_r	$B_r\cos\theta$	sinθ
0.000704	0.026529	0.025182	0.314636
0.002666	0.051632	0.048152	0.360866
0.001401	0.03743	0.032147	0.512212
0.001584	0.039798	0.031821	0.600585



Equation	y = a + b*x
Plot	Brcosθ
Weight	No Weighting
Intercept	0.03862 ± 0.02381
Slope	-0.00961 ± 0.05159
Residual Sum of Squares	2.80937E-4
Pearson's r	-0.13062
R-Square (COD)	0.01706
Adj. R-Square	-0.47441

$$\mathrm{b} = \mathrm{Slope} = \eta$$
$$\mathbf{a} = \mathrm{Intercept} = \frac{\mathbf{k}\lambda}{\mathbf{L}}$$
$$\mathrm{Therefore}, \eta = 0.00961$$
$$\frac{\mathbf{k}\boldsymbol{\lambda}}{\mathbf{L}} = 0.03862$$
$$\mathbf{L} = \frac{\mathbf{k}\lambda}{0.03862}$$
$$\mathbf{L} = \frac{0.94 \times 0.154}{0.03862}$$
$$\mathbf{L} = 3.7483 \text{ nm}$$

Result

$\eta = S$train in the material=0.00961

L= Crystallite Size $= 3.7483$ nm