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20ETMM11

Group-2

Nitride film 0 **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

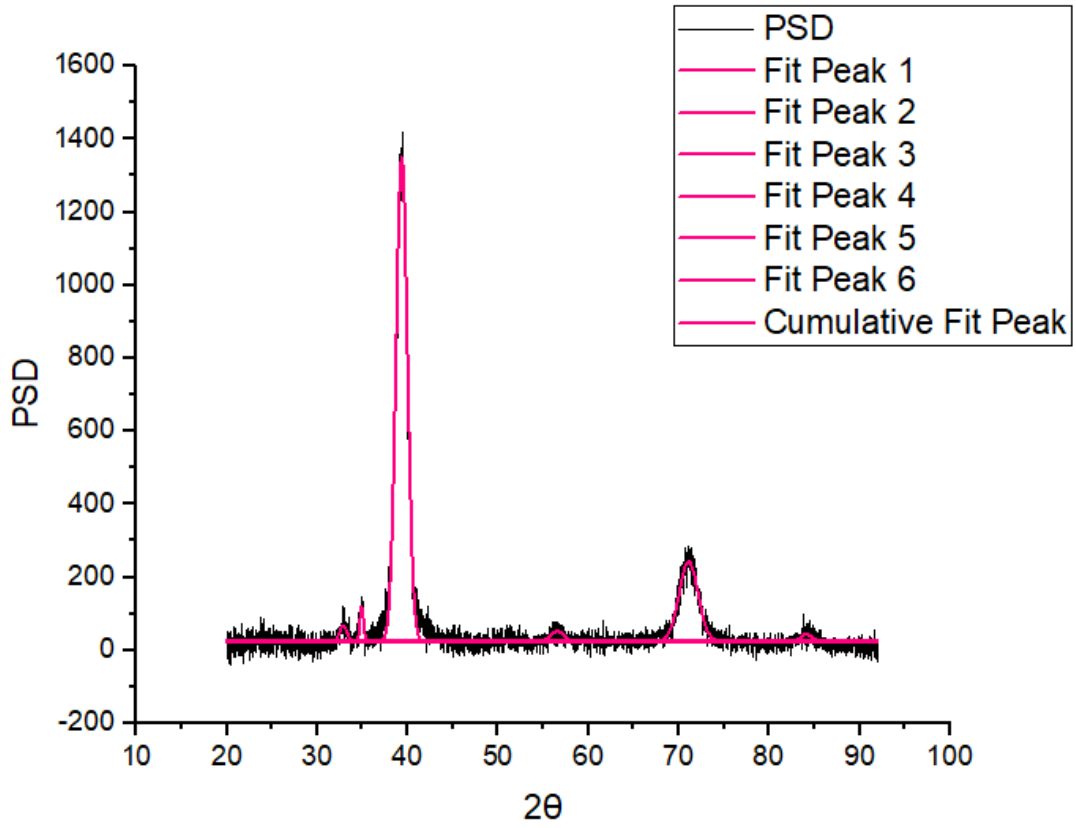
L= Crystallite Size

k=0.94

$\lambda = 0.154$nm

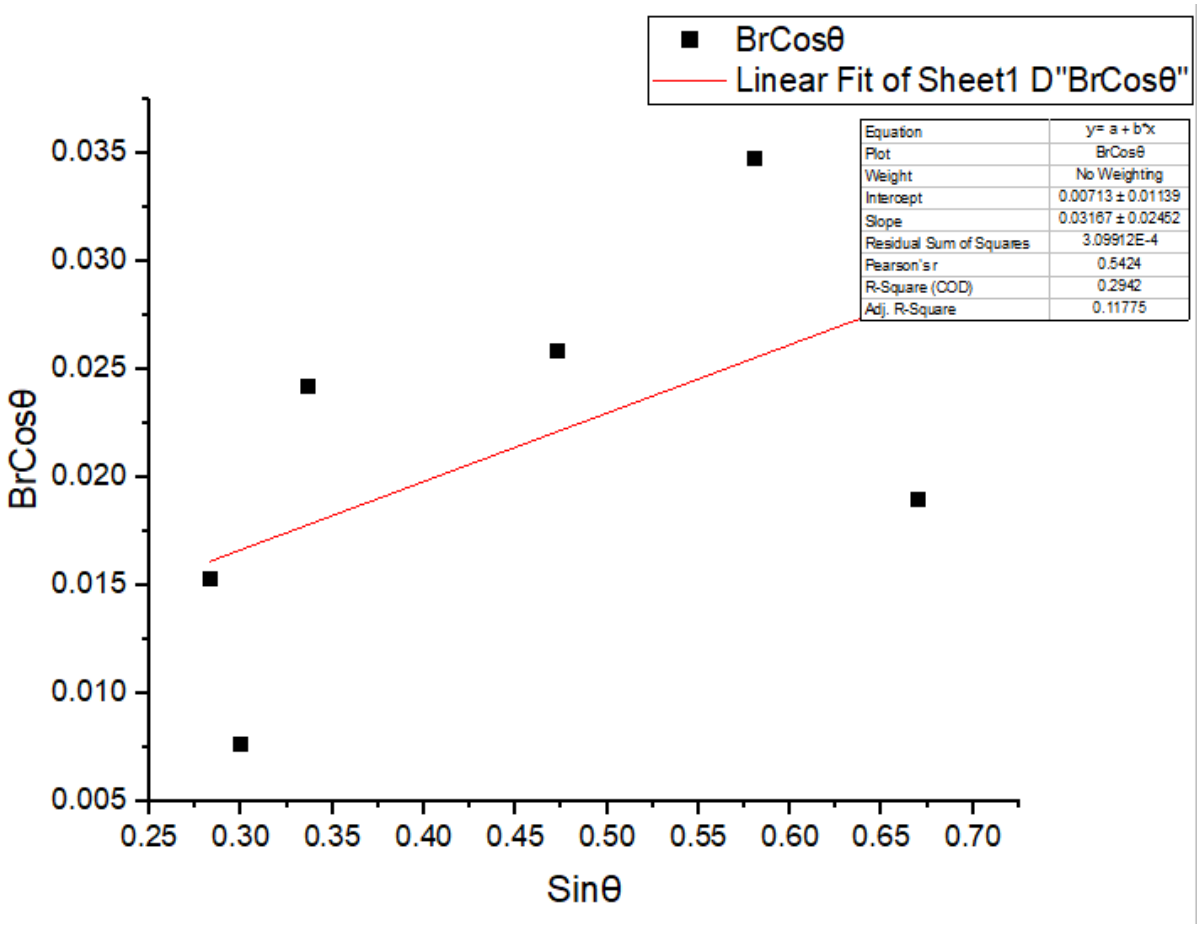
Comparing the above equation with $y = bx + a$ Where, $b = \text{Slope} = \eta$

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



2θ	θ(rad)	B_o(fwhm)	B_o(rad)	B_o^2	B_i(deg)	B_i(rad)	B_i^2
32.89235	0.28704	0.91439	0.015959	0.000255	0.045	0.000785	6.1685E-07
34.91805	0.304717	0.45754	0.007986	6.38E-05	0.045	0.000785	6.1685E-07
39.34331	0.343335	1.47026	0.025661	0.000658	0.045	0.000785	6.1685E-07
56.53556	0.493366	1.68187	0.029354	0.000862	0.045	0.000785	6.1685E-07
71.0858	0.620341	2.44668	0.042703	0.001824	0.045	0.000785	6.1685E-07
84.1166	0.734056	1.46242	0.025524	0.000651	0.045	0.000785	6.1685E-07

$B_r^2=B_o^2-B_i^2$	B_r	$B_r\cos\theta$	sinθ
0.000254077	0.01594	0.015288	0.283114
6.31526E-05	0.007947	0.007581	0.300024
0.000657864	0.025649	0.024152	0.336629
0.00086105	0.029344	0.025844	0.473593
0.001822897	0.042695	0.03474	0.581312
0.00065086	0.025512	0.018942	0.669886



Equation	y = a + b*x
Plot	BrCosθ
Weight	No Weighting
Intercept	0.00713 ± 0.01139
Slope	0.03167 ± 0.02452
Residual Sum of Squares	3.09912E-4
Pearson's r	0.5424
R-Square (COD)	0.2942
Adj. R-Square	0.11775

$$\mathrm{b} = \mathrm{Slope} = \eta$$
$$\mathbf{a} = \mathrm{Intercept} = \frac{\mathbf{k}\lambda}{\mathbf{L}}$$
$$\mathrm{Therefore}, \eta = 0.03167$$
$$\frac{\mathbf{k}\boldsymbol{\lambda}}{\mathbf{L}} = 0.00713$$
$$\mathbf{L} = \frac{\mathbf{k}\lambda}{0.00713}$$
$$\mathbf{L} = \frac{0.94 \times 0.154}{0.00713}$$
$$\mathbf{L} = 20.3029 \text{ nm}$$

Result

$\eta = S$train in the material=0.0316

L= Crystallite Size $= 20.3029$ nm