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LAMPIRAN

Lampiran 1 Tabel data hasil pengujian gaya penekanan maksimum pada proses *micro deep drawing* tanpa pelumas

Kecepatan penekanan (mm/menit)	Ketebalan (mm)	F max (N)	Rata-rata F max (N)	*Displacement* spesimen (mm)	Rata-rata Disp spesimen (mm)	Standar Deviasi
0.5	0.1	54.91	92.87	1.47	1.5	26.86
		110.83		1.49		
		112.90		1.54		
	0.2	122.14	126.33	1.70	1.59	3.75
		131.26		1.50		
		125.59		1.59		
	0.3	175.15	173.67	1.62	1.67	2.91
		177.99		1.60		
		170.89		1.80		
	0.5	249.76	254.77	1.65	1.68	3.66
		256.15		1.40		
		258.42		2.01		

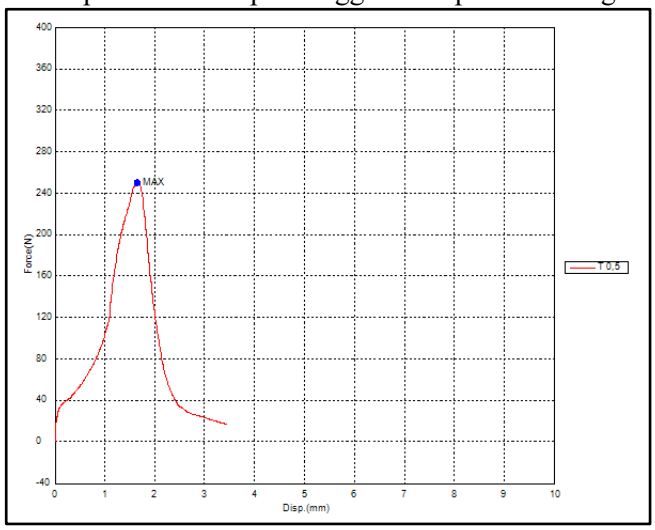
Lampiran 2 Tabel data hasil pengujian gaya penekanan maksimum pada proses *micro deep drawing* menggunakan pelumas

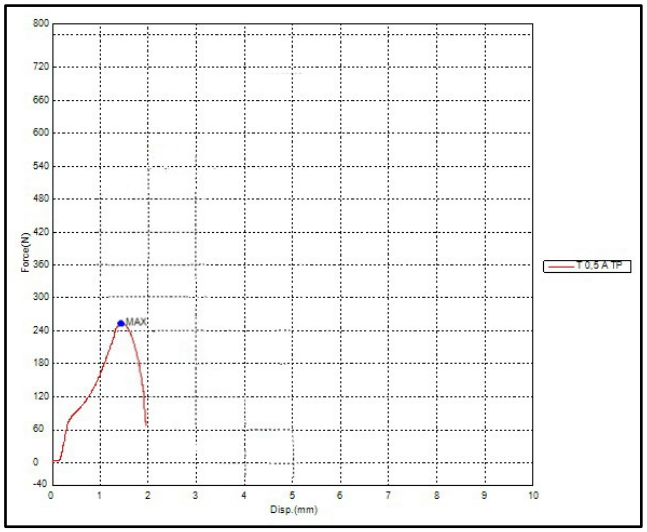
Kecepatan penekanan (mm/menit)	Ketebalan (mm)	F max (N)	Rata-rata F max (N)	*Displacement* spesimen (mm)	Rata-rata Disp spesimen (mm)	Standar Deviasi
0.5	0.1	73.19	74.63	1.71	1.70	1.17
		74.65		1.69		
		76.06		1.71		
	0.2	107.22	110.35	1.61	1.71	2.65
		110.12		1.79		
		113.72		1.75		
	0.3	173.22	170.64	1.63	1.73	1.85
		169.82		1.86		
		168.90		1.70		
	0.5	238.90	235.78	1.72	1.99	3.50
		237.55		2.20		
		230.89		2.05		

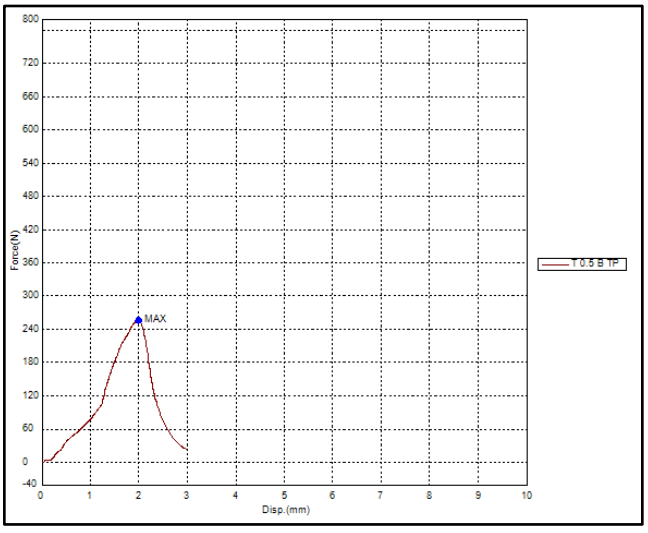
Lampiran 3 Tabel data hasil pengujian cacat pembentukan pada proses *micro deep drawing*

	Ketebalan (mm)	Kedalaman penekanan (mm)	Berhasil (sampel)	*wrinkling* (sampel)	*tearing* (sampel)	*Earing* (sampel)	% Keberhasilan
Pelumas	0.1	1	3	4	1	-	37.5
		1.5	-	6	2	-	0%
		2	-	6	2	-	0%
		2.5	-	-	8	-	0%
	0.2	1	8	-	-	-	100%
		1.5	8	-	-	-	100%
		2	5	2	1	-	62.5%
		2.5	-	-	8	-	0%
	0.3	1	8	-	-	-	100%
		1.5	8	-	-	-	100%
		2	8	-	-	-	100%
		2.5	-	1	7	-	0%
	0.5	1	8	-	-	-	100%
		1.5	8	-	-	-	100%
		2	8	-	-	-	100%
		2.5	4	-	4	-	80%
Tanpa Pelumas	0.1	1	3	3	2	-	37.5%
		1.5	-	6	2	-	0%
		2	-	5	3	-	0%
		2.5	-	-	8	-	0%
	0.2	1	8	-	-	-	100%
		1.5	8	-	-	-	100%
		2	4	2	2	-	50%
		2.5	-	-	8	-	0%
	0.3	1	8	-	-		100%
		1.5	8	-	-	-	100%
		2	7	-	1	-	87.5%
		2.5	-	-	8	-	0%
	0.5	1	8	-	-	-	100%
		1.5	8	-	-	-	100%
		2	6	-	2	-	75%
		2.5	2	-	6	-	25%

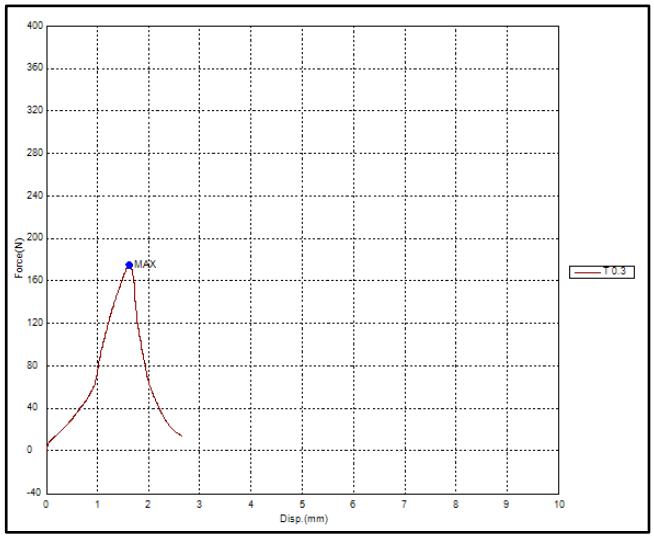
Lampiran 4 Grafik hasil penekanan tanpa menggunakan pelumas dengan ketebalan 0.5 mm.

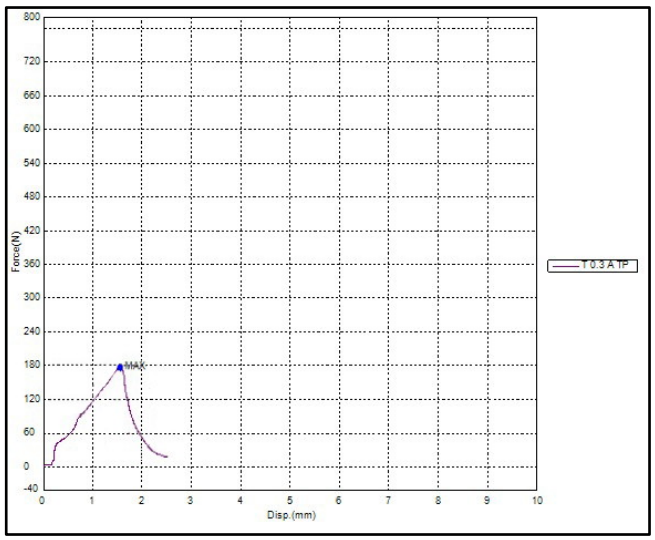


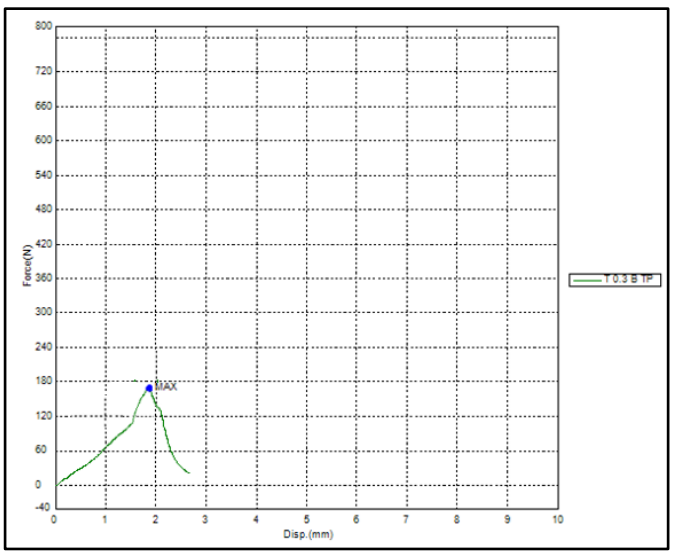




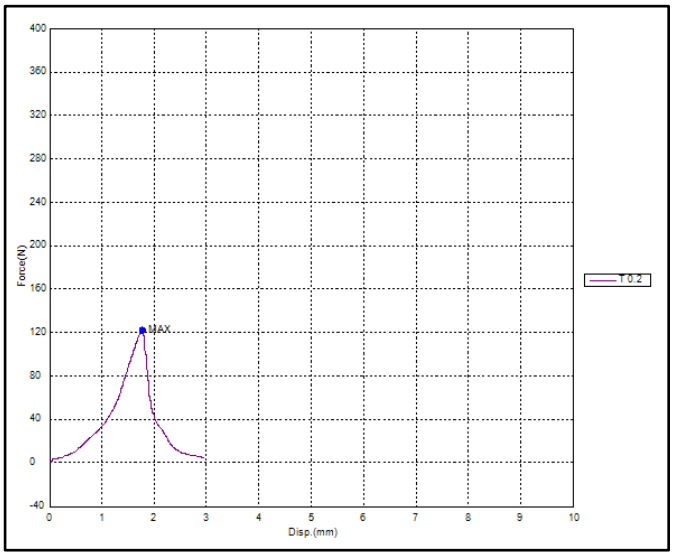
Lampiran 5 Grafik hasil penekanan tanpa menggunakan pelumas dengan ketebalan 0.3 mm.

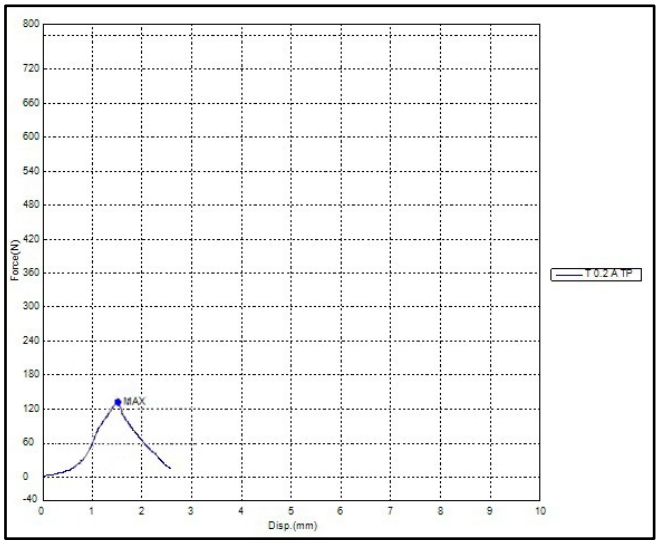


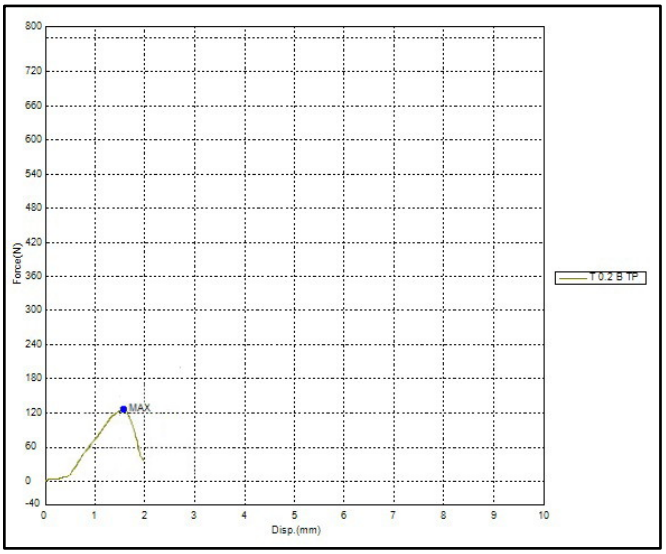




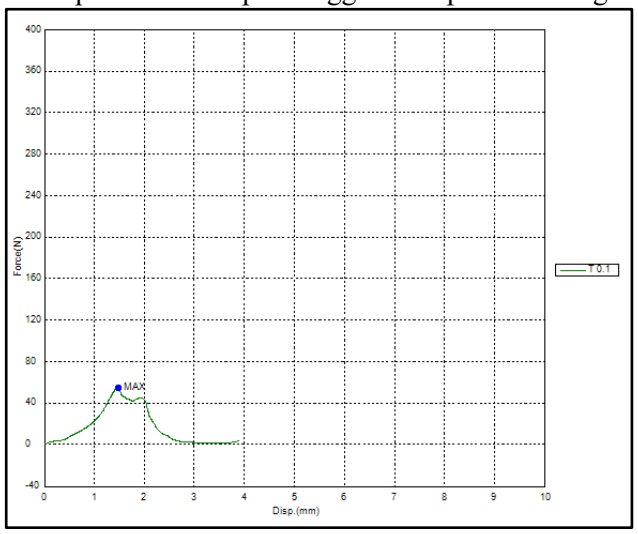
Lampiran 6 Grafik hasil penekanan tanpa menggunakan pelumas dengan ketebalan 0.2 mm

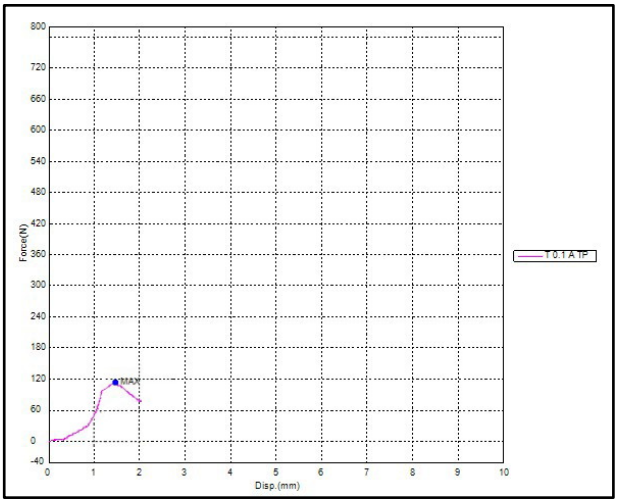


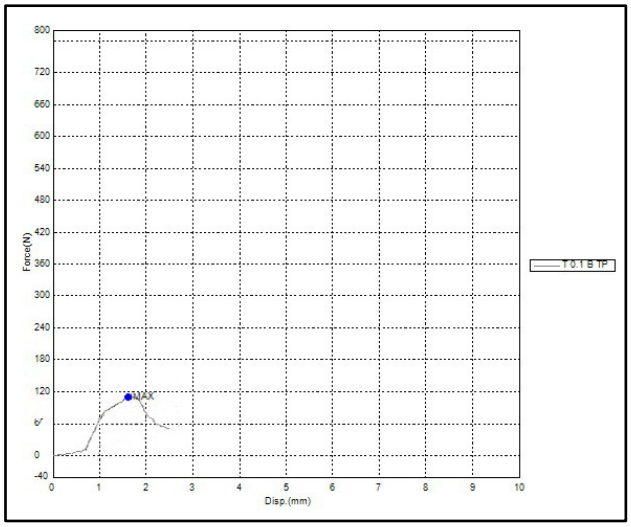




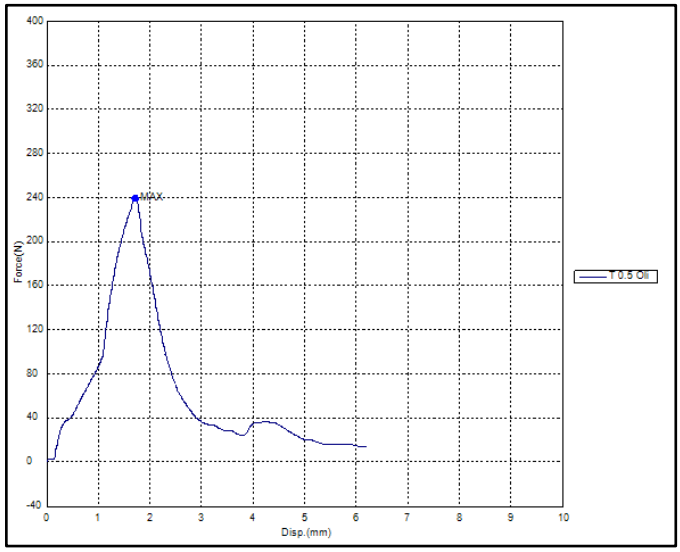
Lampiran 7 Grafik hasil penekanan tanpa menggunakan pelumas dengan ketebalan 0.1 mm

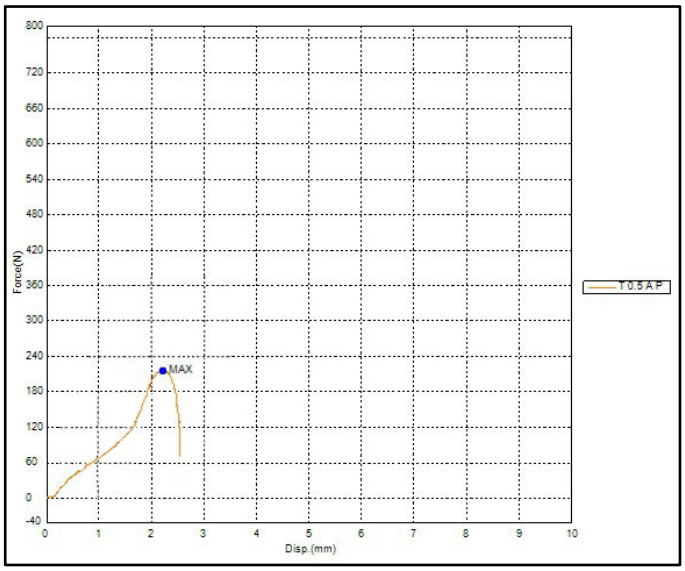


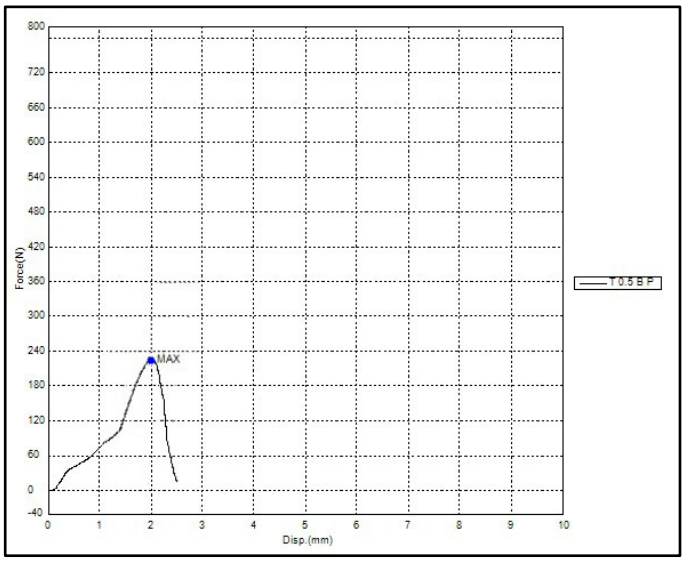




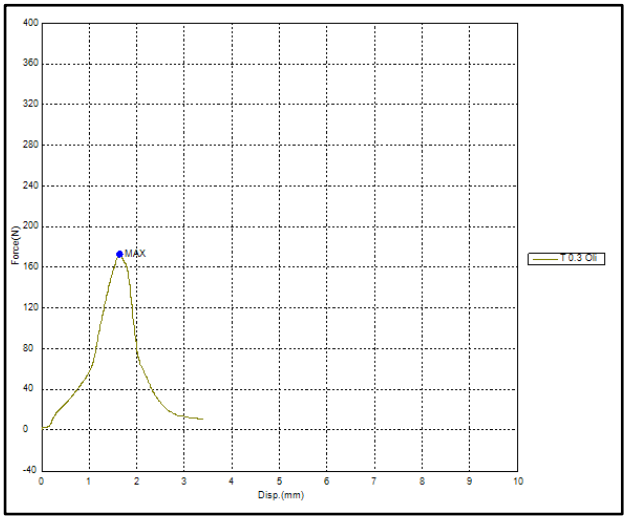
Lampiran 8 Grafik hasil penekanan menggunakan pelumas dengan ketebalan 0.5 mm

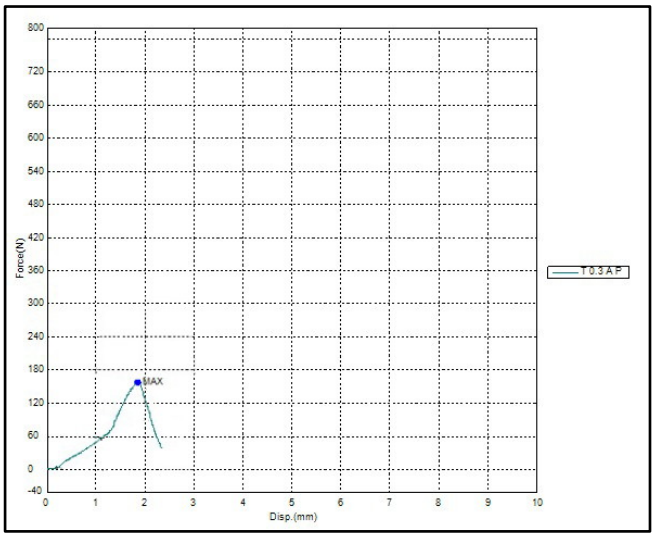


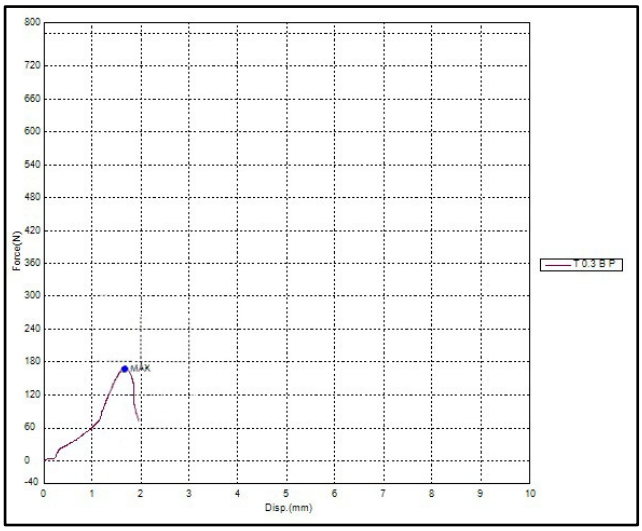




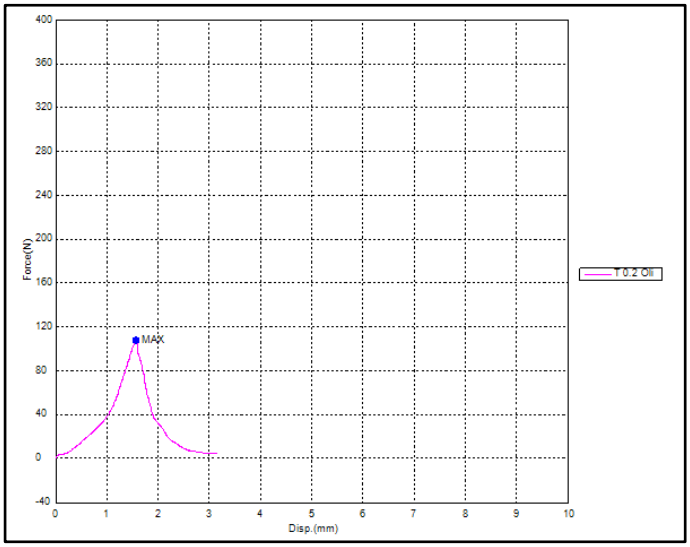
Lampiran 9 Grafik hasil penekanan menggunakan pelumas dengan ketebalan 0.3 mm

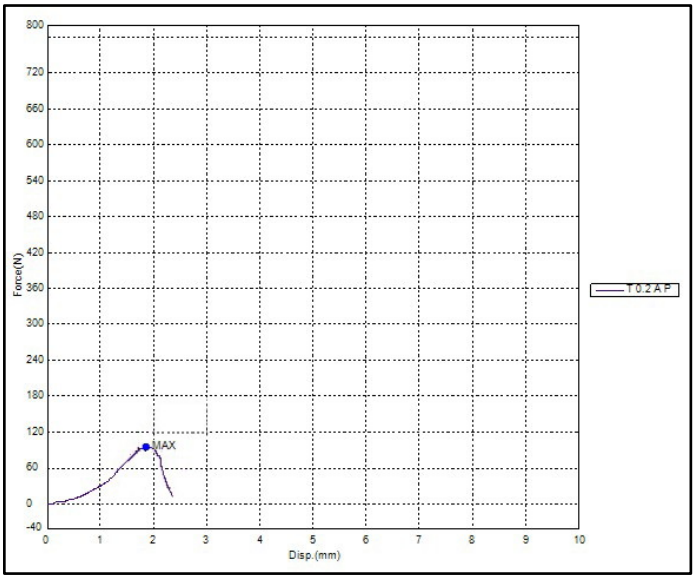


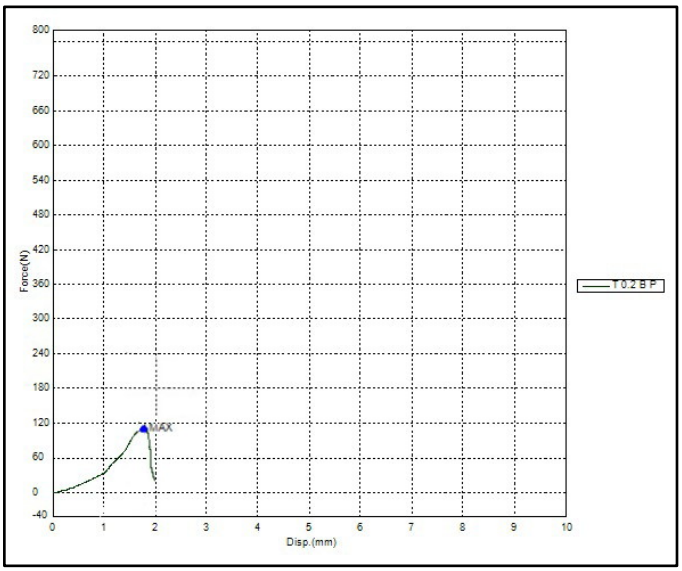




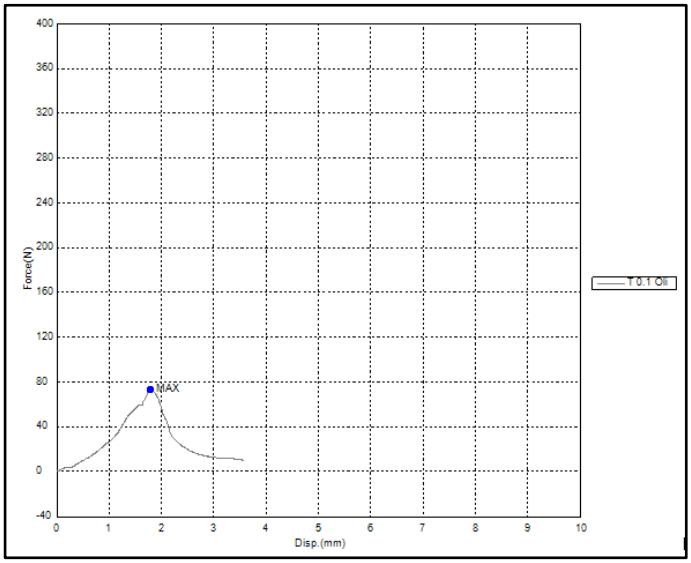
Lampiran 10 Grafik hasil penekanan menggunakan pelumas dengan ketebalan 0.2 mm

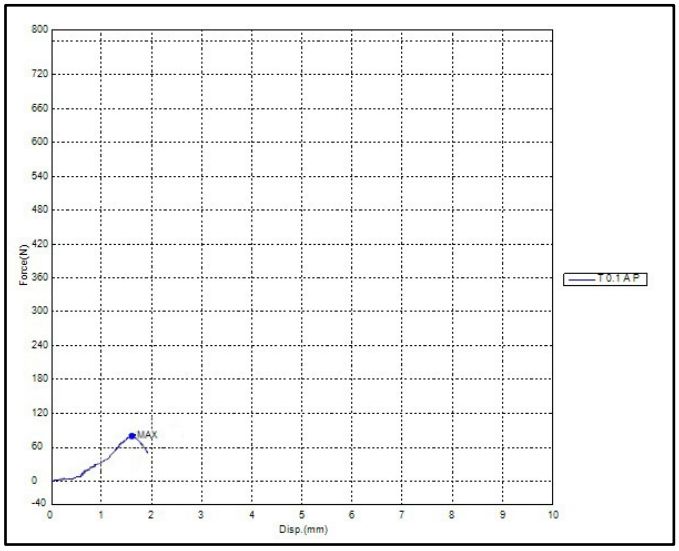


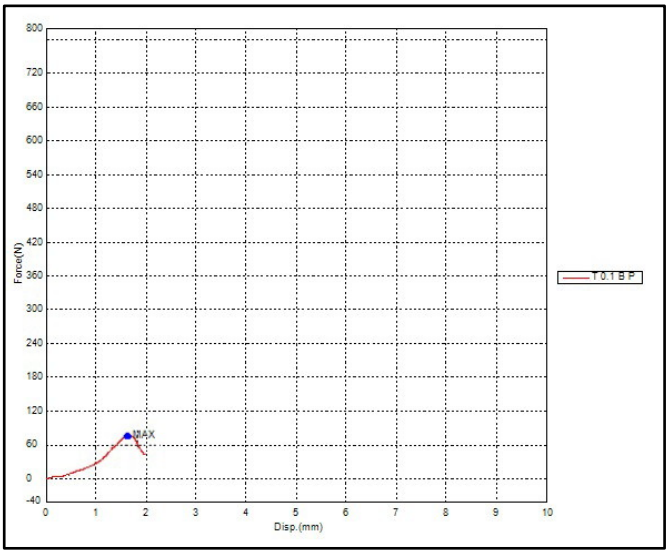




Lampiran 11 Grafik hasil penekanan menggunakan pelumas dengan ketebalan 0.1 mm







Lampiran 12 Hasil Ukuran Distribusi Ketebalan 0.1 mm menggunakan pelumas (berhasil)

LEXT

Report Title

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User name: Administrator
Description: FIRST ADMINISTRATOR

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[Acquisition parameters]
Scanning mode: Color snapshot
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2571
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

Comment

No.	Result	Distance[µm]	File name
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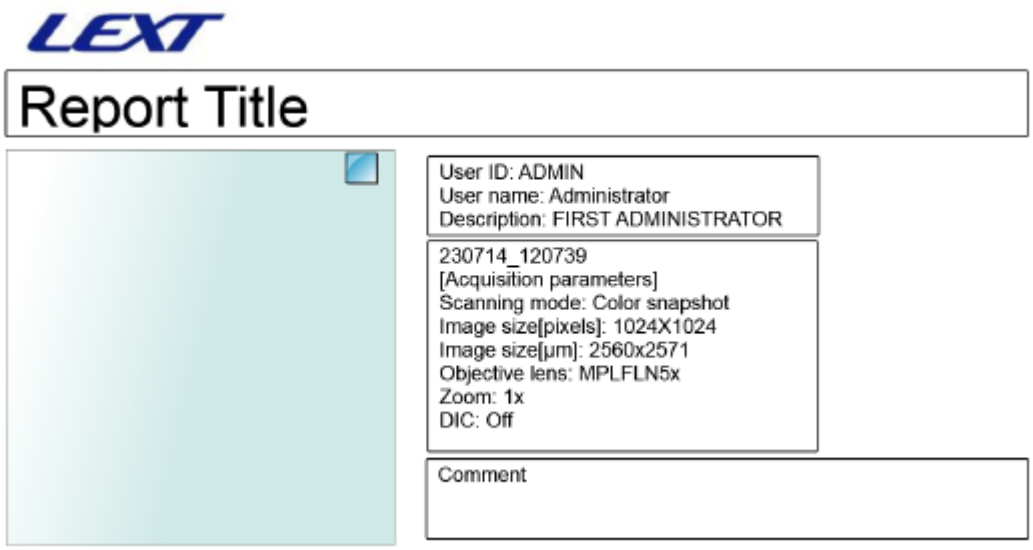
2		152.398	230714_115313
3		149.456	230714_115313
4		157.911	230714_115313
5		123.255	230714_115313
6		178.862	230714_115313
7		201.753	230714_115313
8		201.345	230714_115313
9		187.486	230714_115313
10		155.738	230714_115313
11		137.411	230714_115313
12		113.966	230714_115313
13		137.411	230714_115313

Lampiran 13 Hasil Ukuran Distribusi Ketebalan 0.1 mm menggunakan pelumas (cacat)



No.	Result	Distance[µm]	File name
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3		137.483	230714_120739
4		146.645	230714_120739
5		162.464	230714_120739
6		149.413	230714_120739
7		161.443	230714_120739
8		167.877	230714_120739
9		186.928	230714_120739
10		165.292	230714_120739
11		140.770	230714_120739
12		96.419	230714_120739
13		32.975	230714_120739

Lampiran 14 Hasil Ukuran Distribusi Ketebalan 0.2 mm menggunakan pelumas (berhasil)

LEXT

Report Title

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User name: Administrator
Description: FIRST ADMINISTRATOR

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Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

Comment

	No.	Result	Distance[µm]	File name
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☑	2		226.786	230714_121825
☑	3		221.165	230714_121825
☑	4		277.304	230714_121825
☑	5		246.820	230714_121825
☑	6		230.365	230714_121825
☑	7		182.846	230714_121825
☑	8		172.398	230714_121825
☑	9		191.631	230714_121825
☑	10		209.771	230714_121825

Lampiran 15 Hasil Ukuran Distribusi Ketebalan 0.2 mm menggunakan pelumas (cacat)

LEXT

Report Title

User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_121309
[Acquisition parameters]
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Image size[µm]: 2560x2571
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

Comment

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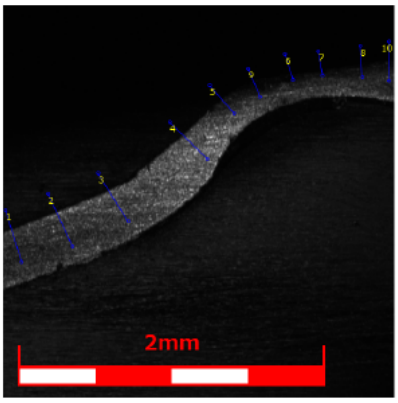
1		208.295	230714_121309
2		216.809	230714_121309
3		219.250	230714_121309
4		208.860	230714_121309
5		201.103	230714_121309
6		201.182	230714_121309
7		189.643	230714_121309
8		140.388	230714_121309
9		149.413	230714_121309
10		133.736	230714_121309
11		53.608	230714_121309
12		103.864	230714_121309
13		128.883	230714_121309

Lampiran 16 Hasil Ukuran Distribusi Ketebalan 0.3 mm menggunakan pelumas (berhasil)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_122420
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

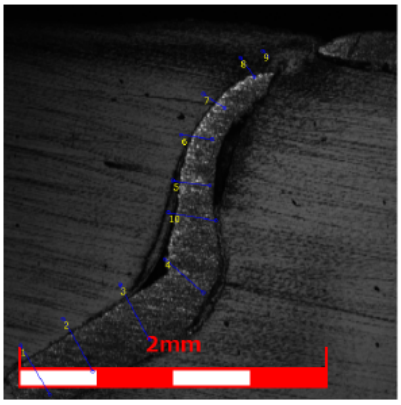
Comment

No.	Result	Distance[µm]	File name
1		356.675	230714_122420
2		383.177	230714_122420
3		373.727	230714_122420
4		346.642	230714_122420
5		242.798	230714_122420
6		177.216	230714_122420
7		161.660	230714_122420
8		203.222	230714_122420
9		201.099	230714_122420
10		260.260	230714_122420

Lampiran 17 Hasil Ukuran Distribusi Ketebalan 0.3 mm menggunakan pelumas (cacat)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_122926
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

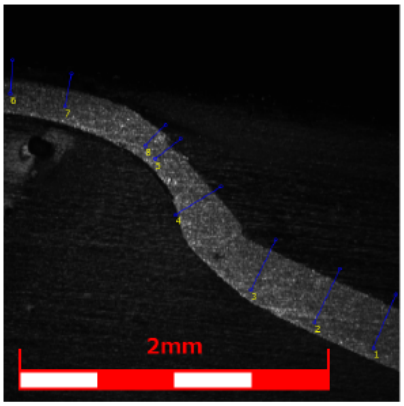
Comment

	No.	Result	Distance[µm]	File name
☑	1		373.160	230714_122926
☑	2		393.701	230714_122926
☑	3		408.579	230714_122926
☑	4		335.203	230714_122926
☑	5		238.809	230714_122926
☑	6		202.465	230714_122926
☑	7		167.212	230714_122926
☑	8		158.807	230714_122926
☑	9		50.461	230714_122926
☑	10		311.081	230714_122926

Lampiran 18 Hasil Ukuran Distribusi Ketebalan 0.3 mm tanpa pelumas (berhasil)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_124800
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

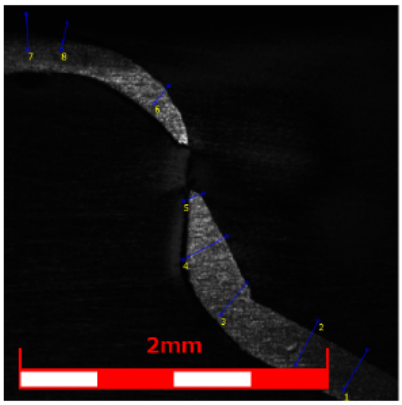
Comment

	No.	Result	Distance[µm]	File name
☑	1		380.911	230714_124800
☑	2		384.583	230714_124800
☑	3		364.853	230714_124800
☑	4		345.682	230714_124800
☑	5		212.598	230714_124800
☑	6		220.087	230714_124800
☑	7		220.607	230714_124800
☑	8		187.628	230714_124800

Lampiran 19 Hasil Ukuran Distribusi Ketebalan 0.3 mm tanpa pelumas (cacat)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_124352
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

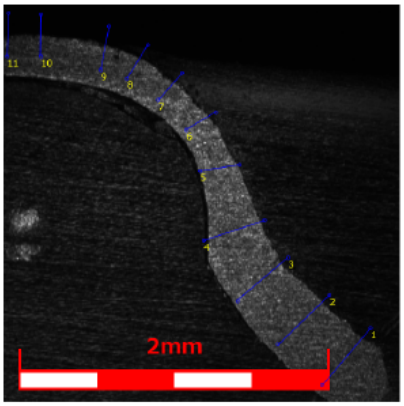
Comment

	No.	Result	Distance[µm]	File name
☑	1		305.033	230714_124352
☑	2		322.606	230714_124352
☑	3		269.919	230714_124352
☑	4		320.196	230714_124352
☑	5		140.898	230714_124352
☑	6		150.215	230714_124352
☑	7		240.169	230714_124352
☑	8		183.544	230714_124352

Lampiran 20 Hasil Ukuran Distribusi Ketebalan 0.5 mm menggunakan pelumas (berhasil)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_123458
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

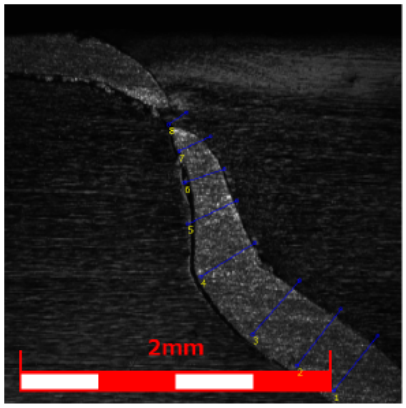
Comment

No.	Result	Distance[µm]	File name
1		484.224	230714_123458
2		462.981	230714_123458
3		430.789	230714_123458
4		415.142	230714_123458
5		256.768	230714_123458
6		222.182	230714_123458
7		233.317	230714_123458
8		257.036	230714_123458
9		285.550	230714_123458
10		273.778	230714_123458
11		280.696	230714_123458

Lampiran 21 Hasil Ukuran Distribusi Ketebalan 0.5 mm menggunakan pelumas (cacat)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_124011
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

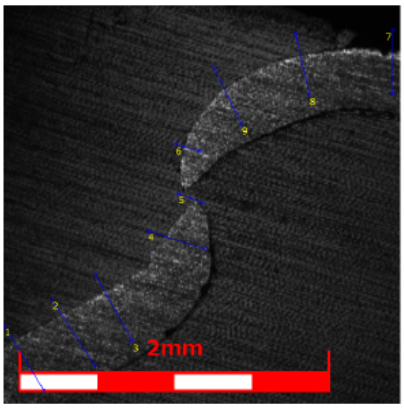
Comment

	No.	Result	Distance[µm]	File name
☑	1		461.618	230714_124011
☑	2		464.890	230714_124011
☑	3		461.894	230714_124011
☑	4		413.479	230714_124011
☑	5		351.533	230714_124011
☑	6		271.495	230714_124011
☑	7		227.459	230714_124011
☑	8		137.508	230714_124011

Lampiran 22 Hasil Ukuran Distribusi Ketebalan 0.5 mm tanpa pelumas (cacat)

LEXT

Report Title



User ID: ADMIN
User name: Administrator
Description: FIRST ADMINISTRATOR

230714_125119
[Acquisition parameters]
Scanning mode: XYZ ultra fast scan + Color
Image size[pixels]: 1024X1024
Image size[µm]: 2560x2593
Objective lens: MPLFLN5x
Zoom: 1x
DIC: Off

Comment

No.	Result	Distance[µm]	File name
1		492.709	230714_125119
2		513.633	230714_125119
3		493.205	230714_125119
4		387.728	230714_125119
5		168.185	230714_125119
6		166.052	230714_125119
7		412.340	230714_125119
8		408.853	230714_125119
9		405.581	230714_125119

Lampiran 23 Gambar tampak isometrik hasil *micro deep drawing*

Lampiran 24 Hasil data XRD sampel 0.5 mm tanpa pelumas

Group : Standard
Data : lpps#8#3a

Strongest 3 peaks

no.	peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	6	44.8247	2.02035	100	0.23490	676	8469
2	3	38.5592	2.33298	77	0.24210	520	6653
3	5	44.4800	2.03521	48	0.20360	326	3751

Peak Data List

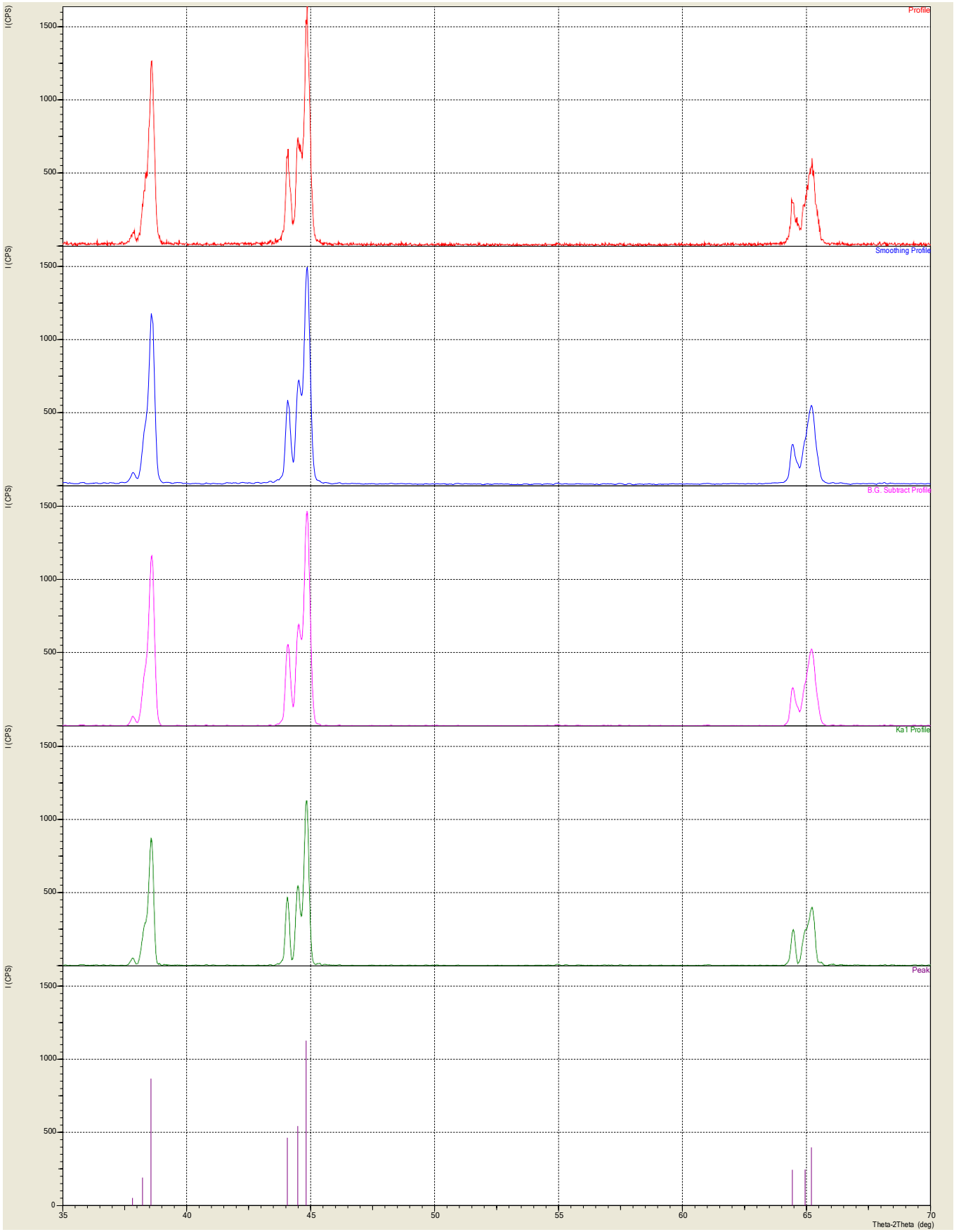
peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	37.8145	2.37720	5	0.18100	31	330
2	38.2200	2.35290	17	0.16000	114	1521
3	38.5592	2.33298	77	0.24210	520	6653
4	44.0620	2.05354	41	0.18720	278	2853
5	44.4800	2.03521	48	0.20360	326	3751
6	44.8247	2.02035	100	0.23490	676	8469
7	64.4309	1.44493	22	0.19740	146	1577
8	64.9400	1.43483	22	0.31700	147	2213
9	65.2000	1.42974	35	0.24560	238	3016

```
# Data Infomation
          Group               : Standard
          Data                : lpps#8#3a
          Sample Nmae         : plate
          Comment             :
          Date & Time         : 09-28-23 11:43:54

# Measurement Condition
    X-ray tube
          target              : Cu
          voltage             : 40.0 (kV)
          current             : 30.0 (mA)
    Slits
          Auto Slit           : not Used
          divergence slit     :   1.00000 (deg)
          scatter slit        :   1.00000 (deg)
          receiving slit      :   0.30000(mm)
    Scanning
          drive axis          : Theta-2Theta
          scan range          :   35.0200 - 70.0000 (deg)
          scan mode           : Continuous Scan
          scan speed          :    2.0000 (deg/min)
          sampling pitch      :    0.0200 (deg)
          preset time         :    0.60 (sec)

# Data Process Condition
    Smoothing                 [ AUTO ]
          smoothing points    : 15
    B.G.Subtruction           [ AUTO ]
          sampling points     : 15
          repeat times        : 30
    Ka1-a2 Separate           [ MANUAL ]
          Ka1 a2 ratio        : 50 (%)
    Peak Search               [ AUTO ]
          differential points : 13
          FWHM threhold       : 0.050 (deg)
          intensity threhold : 30 (par mil)
          FWHM ratio (n-1)/n : 2
    System error Correction   [ NO ]
    Precise peak Correction   [ NO ]
```

< Group: Standard Data: lpps#8#3a >



Lampiran 25 Hasil data XRD sampel 0.1 mm menggunakan pelumas

*** Basic Data Process ***

Group : Standard
Data : lpps#8#3b

Strongest 3 peaks

no.	peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	4	44.5949	2.03023	100	0.51930	540	13291
2	2	38.4234	2.34091	53	0.54190	287	7720
3	6	65.0075	1.43350	53	0.46020	287	6530

Peak Data List

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	37.8000	2.37808	4	0.32000	21	392
2	38.4234	2.34091	53	0.54190	287	7720
3	44.0450	2.05429	31	0.29000	168	2447
4	44.5949	2.03023	100	0.51930	540	13291
5	64.4226	1.44510	19	0.29140	102	1520
6	65.0075	1.43350	53	0.46020	287	6530

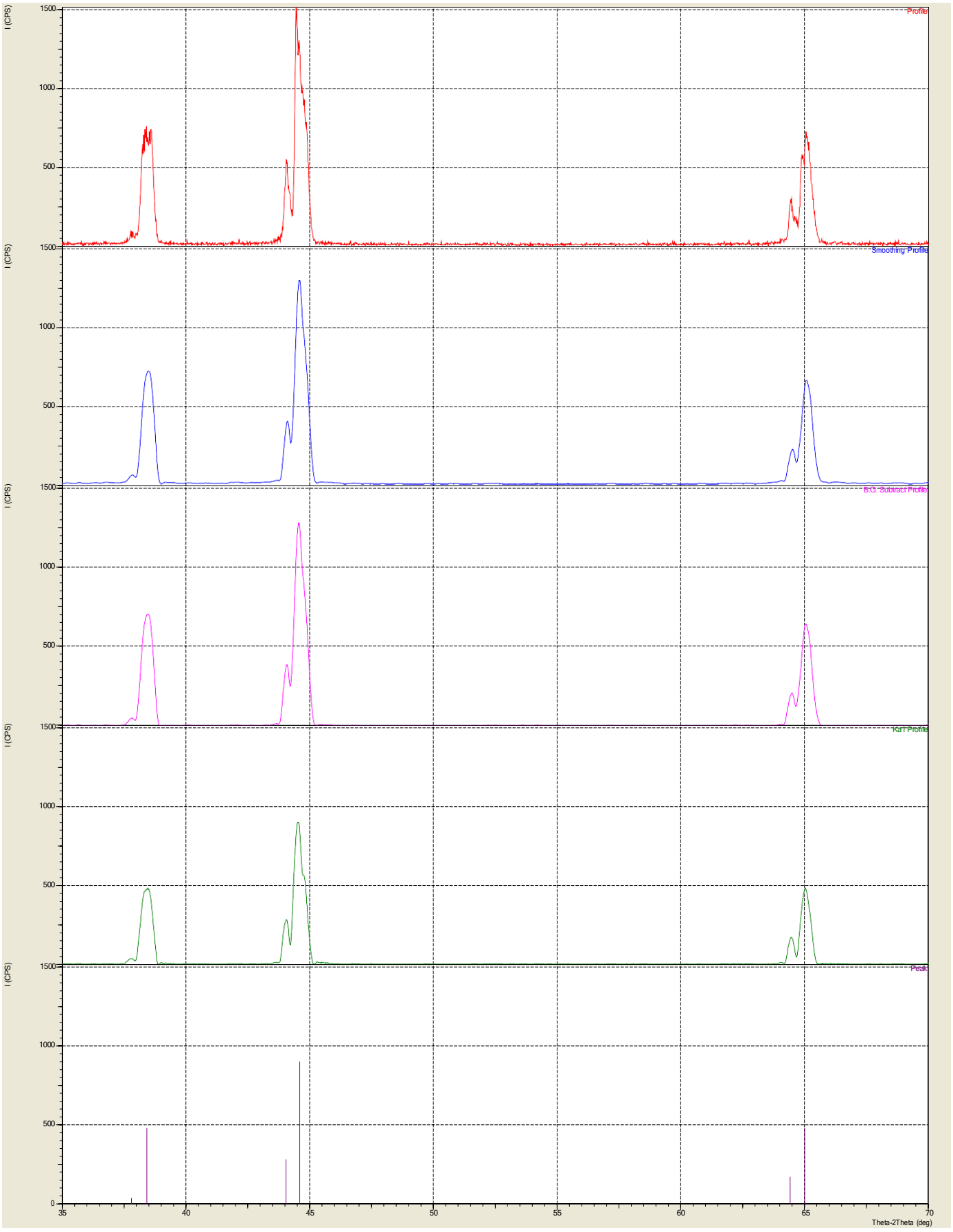
```
          ***  Basic Data Process  ***

# Data Infomation
          Group               : Standard
          Data                : lpps#8#3b
          Sample Nmae         : plate
          Comment             :
          Date & Time         : 09-28-23 14:07:41

# Measurement Condition
    X-ray tube
          target              : Cu
          voltage             : 40.0 (kV)
          current             : 30.0 (mA)
    Slits
          Auto Slit           : not Used
          divergence slit     :   1.00000 (deg)
          scatter slit        :   1.00000 (deg)
          receiving slit      :   0.30000(mm)
    Scanning
          drive axis          : Theta-2Theta
          scan range          :   35.0200 - 70.0000 (deg)
          scan mode           : Continuous Scan
          scan speed          :    2.0000 (deg/min)
          sampling pitch      :    0.0200 (deg)
          preset time         :    0.60 (sec)

# Data Process Condition
    Smoothing                 [ AUTO ]
          smoothing points    : 27
    B.G.Subtruction           [ AUTO ]
          sampling points     : 27
          repeat times        : 30
    Ka1-a2 Separate           [ MANUAL ]
          Ka1 a2 ratio        : 50 (%)
    Peak Search               [ AUTO ]
          differential points : 27
          FWHM threhold       : 0.050 (deg)
          intensity threhold  : 30 (par mil)
          FWHM ratio  (n-1)/n : 2
    System error Correction   [ NO ]
    Precise peak Correction   [ NO ]
```

< Group: Standard Data: lpps#8#3b >



Lampiran 26 Hasil data XRD sampel 0.5 mm menggunakan pelumas

*** Basic Data Process ***

Group : Standard
Data : lpps#8#3c

Strongest 3 peaks

no.	peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	3	44.3669	2.04013	100	0.20510	2187	24155
2	5	64.7902	1.43779	49	0.21500	1076	12327
3	1	38.1030	2.35986	8	0.16190	168	1629

Peak Data List

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	38.1030	2.35986	8	0.16190	168	1629
2	43.9600	2.05807	4	0.12000	97	1666
3	44.3669	2.04013	100	0.20510	2187	24155
4	64.4400	1.44475	5	0.20620	114	1688
5	64.7902	1.43779	49	0.21500	1076	12327

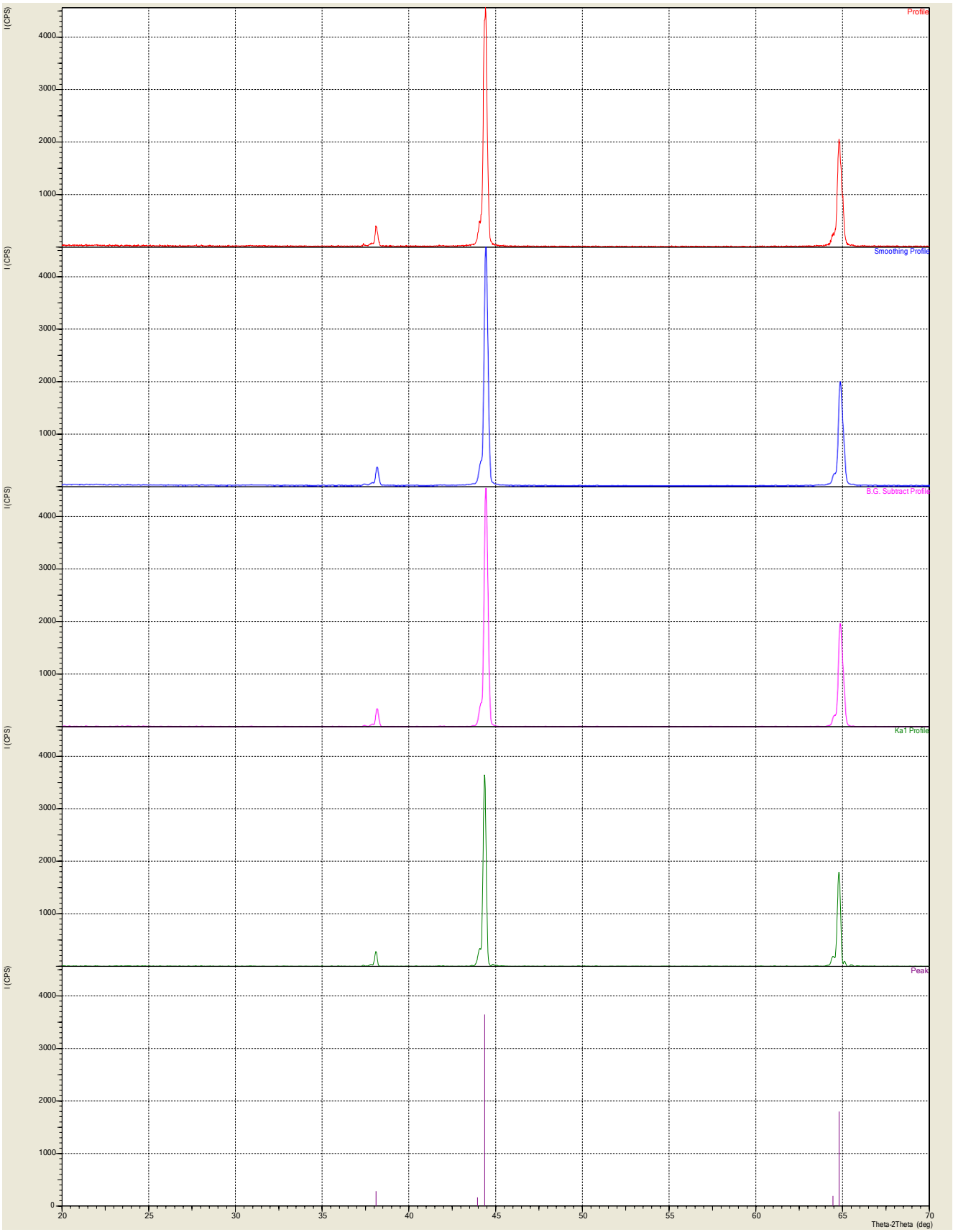
```
         ***  Basic Data Process  ***

# Data Infomation
          Group               : Standard
          Data                : lpps#8#3c
          Sample Nmae         : plate
          Comment             :
          Date & Time         : 09-28-23 11:02:43

# Measurement Condition
    X-ray tube
          target              : Cu
          voltage             : 40.0 (kV)
          current             : 30.0 (mA)
    Slits
          Auto Slit           : not Used
          divergence slit     :   1.00000 (deg)
          scatter slit        :   1.00000 (deg)
          receiving slit      :   0.30000(mm)
    Scanning
          drive axis          : Theta-2Theta
          scan range          :   20.0000 - 70.0000 (deg)
          scan mode           : Continuous Scan
          scan speed          :    2.0000 (deg/min)
          sampling pitch      :    0.0200 (deg)
          preset time         :    0.60 (sec)

# Data Process Condition
    Smoothing                 [ AUTO ]
          smoothing points    : 13
    B.G.Subtruction           [ AUTO ]
          sampling points     : 15
          repeat times        : 30
    Ka1-a2 Separate           [ MANUAL ]
          Ka1 a2 ratio        : 50 (%)
    Peak Search               [ AUTO ]
          differential points : 11
          FWHM threhold       : 0.050 (deg)
          intensity threhold : 30 (par mil)
          FWHM ratio (n-1)/n : 2
    System error Correction   [ NO ]
    Precise peak Correction   [ NO ]
```

< Group: Standard Data: lpps#8#3c >



Lampiran 27 Perhitungan ukuran kristal dan *micro starin* material hasil XRD

Rumus Menghitung ukuran kristal

$$D = \frac{k\lambda}{\beta Cos\theta}$$

Rumus Menghitung *microstrain*:

$$\varepsilon = \frac{\beta}{4\ tan\ \theta}$$

Keterangan:

D : ukuran kristal (nm)

K : kontanta (K = 0.94 pada kristal kubik)

λ : panjang gelombang sinar x (λ = 0.1540 nm)

β : lebar setengah puncak maksimum (FWHM dalam radian)

θ : sudut Bagg dalam derajat

ε : *micro strain*

Daftar puncak difraksi sinar X sampel 0.5 mm tanpa pelumas

No	**No. Puncak**	**Posisi 2 θ**	**FWHW (rad)**
1	6	44.8247	0.23490
2	3	38.5592	0.24210
3	5	44.4800	0.20360

- $D_1 = \frac{0.94\ (0.1540)}{0.23490\ Cos\ (^{44.8247}/_{2})}$ $\varepsilon_1 = \frac{0.2349}{4\tan(^{44.8247}/_{2})}$

  D_1 = 36.58 nm ε_1 = 0.42 με

- $D_2 = \frac{0.94\ (0.1540)}{0.2421\ Cos\ (^{38.5592}/_{2})}$ $\varepsilon_2 = \frac{0.2421}{4\tan(^{38.559}/_{2})}$

  D_2 = 34.76 nm ε_2 = 0.37 με

- $D_3 = \frac{0.94\ (0.1540)}{0.2036\ Cos\ (^{44.4800}/_{2})}$ $\varepsilon_3 = \frac{0.2036}{4\tan(^{44.4800}/_{2})}$

  D_3 = 42.15 nm ε_3 = 0.36 με

Daftar puncak difraksi sinar X sampel 0.5 mm menggunakan pelumas

No	No. Puncak	Posisi 2 θ	FWHW (rad)
1	3	44.3669	0.20510
2	5	64.8902	0.21500
3	1	38.1030	0.16190

- $D_1 = \frac{0.94\ (0.1540)}{0.2051\ Cos\ (^{44.3669}/_{2})}$ $\varepsilon_1 = \frac{0.2051}{4\tan(^{44.3669}/_{2})}$

  $D_1 = 41.83$ nm $\varepsilon_1 = 0.36\ \mu\varepsilon$

- $D_2 = \frac{0.94\ (0.1540)}{0.2150\ Cos\ (^{64.8902}/_{2})}$ $\varepsilon_2 = \frac{0.2150}{4\tan(^{64.8902}/_{2})}$

  $D_2 = 43.76$ nm $\varepsilon_2 = 0.38\ \mu\varepsilon$

- $D_3 = \frac{0.94\ (0.1540)}{0.1619\ Cos\ (^{38.1030}/_{2})}$ $\varepsilon_3 = \frac{0.1619}{4\tan(^{38.1030}/_{2})}$

  $D_3 = 51.91$ nm $\varepsilon_3 = 0.24\ \mu\varepsilon$

Daftar puncak difraksi sinar X sampel 0.1 mm menggunakan pelumas

No	No. Puncak	Posisi 2 θ	FWHW (rad)
1	4	44.5949	0.51930
2	2	38.4234	0.54190
3	6	65.0075	0.46020

- $D_1 = \frac{0.94\ (0.1540)}{0.5193\ Cos\ (^{44.5949}/_{2})}$ $\varepsilon_1 = \frac{0.5193}{4\tan(^{44.5949}/_{2})}$

  $D_1 = 16.53$ nm $\varepsilon_1 = 0.92\ \mu\varepsilon$

- $D_2 = \frac{0.94\ (0.1540)}{0.5419\ Cos\ (^{38.4234}/_{2})}$ $\varepsilon_2 = \frac{0.5419}{4\tan(^{38.4234}/_{2})}$

  $D_2 = 15.52$ nm $\varepsilon_2 = 0.82\ \mu\varepsilon$

- $D_3 = \frac{0.94\ (0.1540)}{0.4602\ Cos\ (^{65.0075}/_{2})}$ $\varepsilon_3 = \frac{0.4602}{4\tan(^{65.0075}/_{2})}$

  $D_3 = 20.46$ nm $\varepsilon_3 = 1.01\ \mu\varepsilon$