

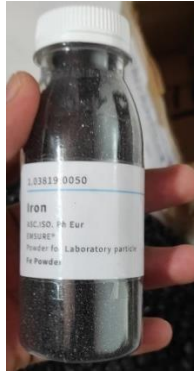
## LAMPIRAN

### 1. Persiapan Alat dan Bahan

A



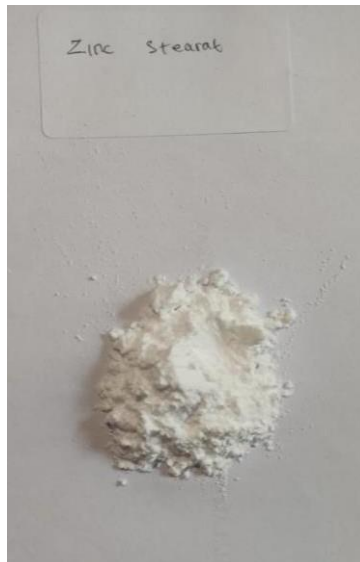
B



C



D



**Keterangan A.** Cetakan spesimen, **B.** Serbuk Iron Powder, **C.** Serbuk Arang Batok Kelapa Carbon, **D.** Zinc Stearat

## 2. Pembuatan Spesimen

A



B



C



D



E



F



**Keterangan** A. Menimbang serbuk Iron Powder 98%, B. Menimbang serbuk Arang Batok Kelapa Carbon 2%, C. Menimbang Zinc Stearat sebesar 5%, D. Penuangan serbuk spesimen paduan ke dalam cetakan yang sudah sesuai dengan komposisi yang di tentukan, E. Proses penekanan kompaksi spesimen dengan waktu tahan 10 menit, F. Penimbangan hasil spesimen setelah dikompaksi

### 3. Proses Sintering

A



B



C



**D****E****F**

**Keterangan** A. Mesin furnace, B. Penataan spesimen untuk proses sintering, C. temperatur pada furnace 900°C, 1000°C, 1100°C sesuai dengan variasi, D. Waktu tahan temperature sinter, E. Spesimen setelah disinter, F. Proses pendinginan normalizing.

#### 4. Proses Penuaan Spesimen

**A****B****C**

**Keterangan** A. Mengatur temperature untuk penuaan spesimen, B. Proses penuaan spesimen, C. Waktu tahan temperature sinter

## 5. Proses Pengujian Densitas

A



B



**Keterangan A.** Pengukuran ukuran spesimen serta pengambilan data tinggi spesimen,  
**B.** Penimbangan berat massa spesimen untuk pengambilan data

## 6. Proses pengujian Kekerasan Vickers

A



B



C



D



**Keterangan** A. Alat uji kekerasan vickers, B. Mengatur indenter load 100gf dan menempatkan spesimen C. Mendata hasil nilai pada uji kekerasan vickers, D. Hasil nilai data pada uji vickers.

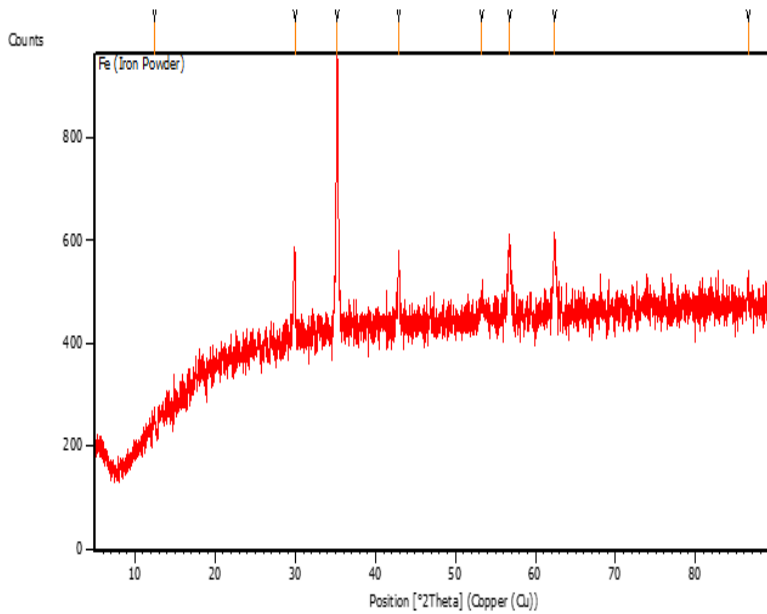
## 7. Data hasil pengujian XRD Serbuk Besi (*Iron Powder*)

This is the simple example template containing only headers for each report item and the bookmarks. The invisible bookmarks are indicated by text between brackets. Modify it according to your own needs and standards.

### **Measurement Conditions:** (Bookmark 1)

Dataset Name	Fe (Iron Powder)
File name	E\DATA PENGUJIAN-XRD\Pengujian
2023\April\Nugraha\Fe (Iron Powder) \Fe (Iron Powder) {d	
Comment	Configuration=Reflection-Transmission Sp Goniometer=PW3050/60 (Theta/Theta); Mini
Measurement Date / Time	4/25/2023 1:31:00 PM
Raw Data Origin	PHILIPS-binary (scan) (RD)
Scan Axis	Gonio
Start Position [ $^{\circ}$ 2Th.]	5.0084
End Position [ $^{\circ}$ 2Th.]	89.9744
Step Size [ $^{\circ}$ 2Th.]	0.0170
Scan Step Time [s]	10.1500
Scan Type	Continuous
Offset [ $^{\circ}$ 2Th.]	0.0000
Divergence Slit Type	Fixed
Divergence Slit Size [ $^{\circ}$ ]	1.0000
Specimen Length [mm]	10.00
Receiving Slit Size [mm]	12.7500
Measurement Temperature [ $^{\circ}$ C]	-273.15
Anode Material	Cu
K-Alpha1 [ $\text{\AA}$ ]	1.54060
K-Alpha2 [ $\text{\AA}$ ]	1.54443
K-Beta [ $\text{\AA}$ ]	1.39225
K-A2 / K-A1 Ratio	0.50000
Generator Settings	30 mA, 40 kV
Diffractometer Type	XPert MPD
Diffractometer Number	1
Goniometer Radius [mm]	200.00
Dist. Focus-Diverg. Slit [mm]	91.00
Incident Beam Monochromator	No
Spinning	Yes

### **Main Graphics, Analyze View:** (Bookmark 2)



**Peak List:** (Bookmark 3)

Pos. [ $^{\circ}2\theta$ .]	Height [cts]	FWHMLeft [ $^{\circ}2\theta$ .]	d-spacing [ $\text{\AA}$ ]	Rel. Int. [%]
12.4366	23.92	0.4015	7.11742	4.59
29.9155	169.82	0.2007	2.98690	32.57
35.1778	521.35	0.0669	2.55121	100.00
42.8568	131.09	0.1673	2.11020	25.14
53.3120	34.27	0.8029	1.71842	6.57
56.7229	142.44	0.2676	1.62292	27.32
62.3318	147.65	0.2007	1.48968	28.32
86.4731	53.10	0.2007	1.12544	10.19



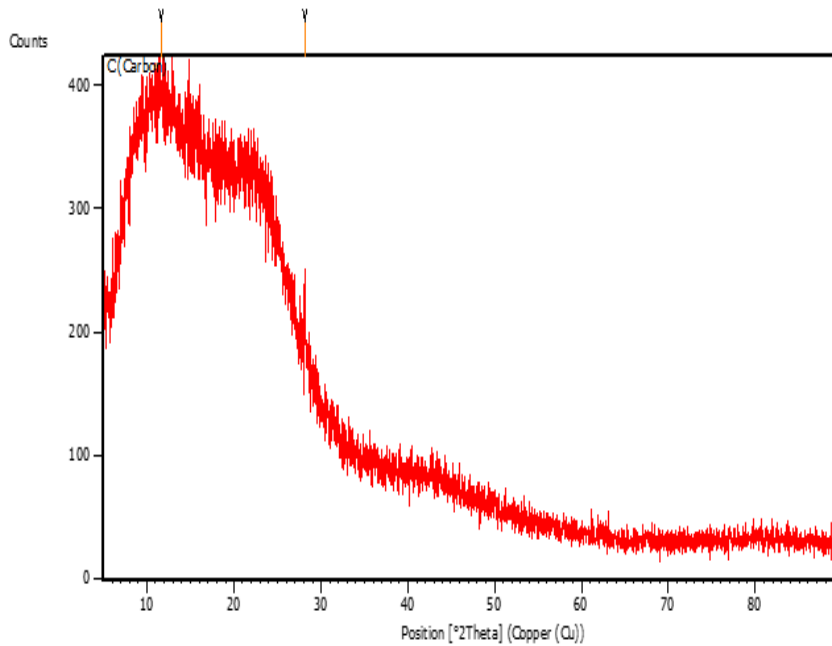
## 8. Data hasil pengujian XRD Arang Batok Kelapa (*Carbon*)

This is the simple example template containing only headers for each report item and the bookmarks. The invisible bookmarks are indicated by text between brackets. Modify it according to your own needs and standards.

### **Measurement Conditions:** (Bookmark 1)

Dataset Name	C (Carbon)
File name	E:\DATA PENGUJIAN-XRD\Pengujian
2023\April\Nugraha\C (Carbon)\C (Carbon).rd	
Comment	Configuration=Reflection-Transmission Sp Goniometer=PW3050/60 (Theta/Theta); Mini
Measurement Date / Time	4/25/2023 1:40:00 PM
Raw Data Origin	PHILIPS-binary (scan) (RD)
Scan Axis	Gonio
Start Position [°2Th.]	5.0084
End Position [°2Th.]	89.9744
Step Size [°2Th.]	0.0170
Scan Step Time [s]	10.1500
Scan Type	Continuous
Offset [°2Th.]	0.0000
Divergence Slit Type	Fixed
Divergence Slit Size [°]	1.0000
Specimen Length [mm]	10.00
Receiving Slit Size [mm]	12.7500
Measurement Temperature [°C]	-273.15
Anode Material	Cu
K-Alpha1 [Å]	1.54060
K-Alpha2 [Å]	1.54443
K-Beta [Å]	1.39225
K-A2 / K-A1 Ratio	0.50000
Generator Settings	30 mA, 40 kV
Diffractometer Type	XPert MPD
Diffractometer Number	1
Goniometer Radius [mm]	200.00
Dist. Focus-Diverg. Slit [mm]	91.00
Incident Beam Monochromator	No
Spinning	Yes

### **Main Graphics, Analyze View:** (Bookmark 2)

**Peak List:** (Bookmark 3)

Pos. [°2Th.]	Height [cts]	FWHM Left [°2Th.]	d-spacing [Å]	Rel. Int. [%]
11.6244	78.00	0.0900	7.60652	100.00
28.1410	64.84	0.1020	3.16844	83.13

**9. Data Hasil Uji Densitas *IRON POWDER – CARBON 2%***

Kompaksi	Suhu	Kodevikasi	massa	r <sup>2</sup> (mm)	t (mm)	Densitas (gr/cm <sup>3</sup> )	
7000	900	A1	a	7,953	100	7,65	3,311
			b	7,957	100	7,62	3,326
			c	8,000	100	7,68	3,317
				Hasil Rata Rata			3,318
8000		A2	a	7,999	100	7,51	3,392
			b	8,000	100	7,46	3,415
			c	8,000	100	7,53	3,383
				Hasil Rata Rata			3,397
9000		A3	a	7,902	100	7,41	3,396
			b	8,000	100	7,55	3,375
			c	8,000	100	7,50	3,397
				Hasil Rata Rata			3,389
7000	1000	B1	a	8,000	100	7,56	3,370
			b	8,000	100	7,47	3,411
			c	8,000	100	7,58	3,361
				Hasil Rata Rata			3,381
8000		B2	a	7,855	100	7,38	3,390
			b	7,998	100	7,52	3,387
			c	7,570	100	7,23	3,334
				Hasil Rata Rata			3,370
9000		B3	a	8,000	100	7,57	3,366
			b	7,961	100	7,46	3,399
			c	7,125	100	6,79	3,342
				Hasil Rata Rata			3,369
7000	1100	C1	a	7,996	100	7,56	3,368
			b	7,998	100	7,58	3,360
			c	7,972	100	7,64	3,323
				Hasil Rata Rata			3,351
8000		C2	a	8,000	100	7,49	3,402
			b	8,000	100	7,54	3,379
			c	7,999	100	7,39	3,447
				Hasil Rata Rata			3,409

9000		C3	a	8,000	100	7,40	3,443
			b	7,803	100	7,28	3,414
			c	8,000	100	7,34	3,471
Hasil Rata Rata							3,443

#### 10. Data Hasil pengujian Densitas *IRON POWDER* Murni

Kompaks i	Suh u	Kodevikas i	massa	r <sup>2</sup> (mm)	t (mm)	Densitas (gr/cm <sup>3</sup> )	
7000	900	A4	a	8,000	100	6,37	4,000
			b	8,000	100	6,33	4,025
			c	8,000	100	6,41	3,975
Hasil Rata Rata						4,000	
8000		A5	a	8,000	100	6,33	4,025
			b	8,000	100	6,35	4,012
			c	7,999	100	6,33	4,024
Hasil Rata Rata						4,021	
9000		A6	a	8,000	100	6,33	4,025
			b	8,000	100	6,29	4,051
			c	8,000	100	6,41	3,975
Hasil Rata Rata						4,017	
7000	1000	B4	a	7,990	100	6,46	3,939
			b	7,998	100	6,38	3,992
			c	8,000	100	6,42	3,968
Hasil Rata Rata						3,967	
8000		B5	a	8,000	100	6,36	4,006
			b	8,000	100	6,49	3,926
			c	8,000	100	6,39	3,987
Hasil Rata Rata						3,973	
9000		B6	a	8,000	100	6,35	4,012
			b	7,999	100	6,33	4,024
			c	7,990	100	6,32	4,026
Hasil Rata Rata						4,021	
7000	1100	C4	a	7,925	100	6,26	4,032
			b	7,903	100	6,31	3,989
			c	8,000	100	6,35	4,012
Hasil Rata Rata						4,011	

8000		C5	a	8,000	100	6,41	3,975
			b	7,999	100	6,32	4,031
			c	8,000	100	6,43	3,962
			Hasil Rata Rata				3,989
9000		C6	a	8,000	100	6,43	3,962
			b	7,923	100	6,35	3,974
			c	7,927	100	6,25	4,039
			Hasil Rata Rata				3,992

## 11. Data Pengujian Kekerasan



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,  
RISET, DAN TEKNOLOGI  
POLITEKNIK NEGERI MALANG  
JURUSAN TEKNIK MESIN

Jl. Soekarno Hatta No.9 Jatimulyo, Lowokwaru, Malang, 65141  
Telp. (0341) 404424 – 404425, Fax (0341) 404420,  
<http://www.polinema.ac.id>

**SURAT KETERANGAN**  
NOMOR : 33/LAB.TM/2023

Yang bertanda tangan dibawah ini :

Nama : Rafik Djoenaidi,ST  
NIP : 19780125 200112 1 002  
Jabatan : Pranata Laboratorium Pendidikan  
Politeknik Negeri Malang

Menerangkan dengan sesungguhnya bahwa mahasiswa :

NO	Nama	NIM/NPM	Prodi	Instansi
1	Agus Mujiyanto	1421900135	S-1 Teknik Mesin	Universitas 17 Agustus 1945 Surabaya
2	Al Fatham Ardiansyah Widiyanto	1421900005	S-1 Teknik Mesin	Universitas 17 Agustus 1945 Surabaya

Benar benar telah melaksanakan pengambilan data di Jurusan Teknik Mesin Politeknik Negeri Malang, guna keperluan penyusunan skripsi.

Demikian surat keterangan ini dibuat untuk dipergunakan sebagaimana mestinya.

Malang, 25 Mei 2023

Pranata Laboratorium Pendidikan  
Politeknik Negeri Malang



**TABEL NILAI UJI KEKERASAN MICRO VICKERS HARDNESS TESTER**

Kompaksi (Psi)	Komposisi (%)	Waktu tahan (menit)	Suhu (°C)	Spesimen	Nilai kekerasan (HVN)
7000	2%	90	900	a	680,3
				b	690,7
				c	762,0
8000				a	654,7
				b	647,7
				c	619,2
9000				a	614,3
				b	695,0
				c	660,2
7000	2%	90	1000	a	881,4
				b	672,2
				c	577,8
8000				a	511,5
				b	548,6
				c	714,5
9000				a	787,5
				b	586,9
				c	608,3
7000	2%	90	1100	a	675,8
				b	752,3
				c	765,9
8000				a	715,4
				b	767,4
				c	570,5
9000				a	669,7
				b	723,5
				c	709,2


  
 PENGUKURAN & PERALATAN  
 B III  
 L. B. B. H. N. TEKNIK MESIN  
 POLITEKNIK NEGERI MALANG

**TABEL NILAI UJI KEKERASAN MICRO VICKERS HARDNESS TESTER**

Kompaksi (Psi)	Komposisi (%)	Waktu tahan (menit)	Suhu (°C)	Spesimen	Nilai kekerasan (HVN)
7000	Fe-Murni	90	900	a	811,1
				b	818,7
				c	538,9
8000				a	711,0
				b	723,9
				c	775,8
9000				a	793,2
				b	679,3
				c	695,7
7000	Fe-Murni	90	1000	a	490,9
				b	653,1
				c	573,9
8000				a	651,2
				b	738,6
				c	631,6
9000				a	582,3
				b	615,7
				c	604,1
7000	Fe-Murni	90	1100	a	599,7
				b	584,9
				c	647,7
8000				a	534,3
				b	567,0
				c	800,0
9000				a	864,0
				b	817,7
				c	659,8

PENERAPAN & PERLAKUAN  
 BAHAN  
 LAB. BAHAN TEKNIK MESIN  
 POLITEKNIK NEGERI MATARAM