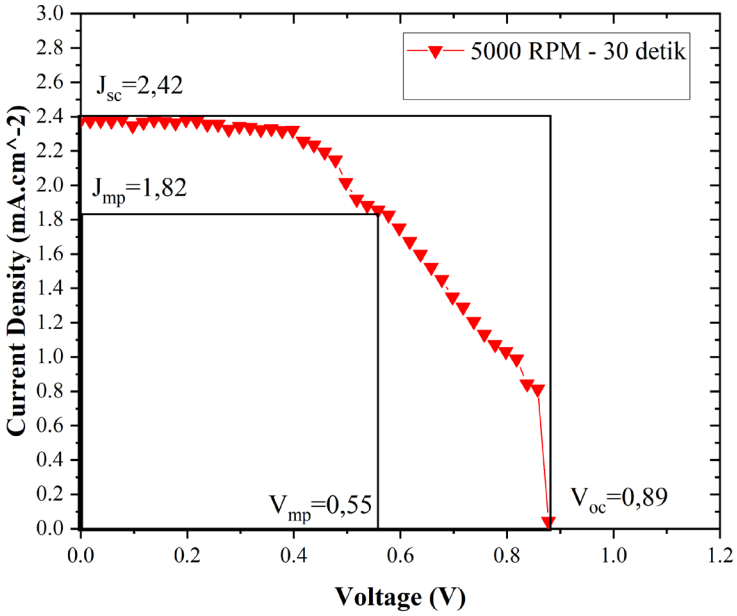
LAMPIRAN A

CONTOH PERHITUNGAN

Lampiran A. Contoh Perhitungan

A.1 Perhitungan PCE



Gambar A.1 Kurva I-V Contoh Perhitungan I-V *Test*

1. Perhitunga P_{in}

   Rumus: $P_{in} = J_{mp} \times V_{mp}$

   Diketahui:

   $J_{mp} = 1{,}79\ mA.cm^{-2}$

   $V_{mp} = 0{,}58\ V$

   Perhitungan:

   $P_{in} = 1{,}79 \times 0{,}58$

   $P_{in} = 1{,}0$

2. Perhitungan Nilai FF

   Rumus: $FF = \frac{J_{mp} \times V_{mp}}{J_{sc} \times V_{oc}} \times 100\%$

Diketahui

J_{sc} = 2,42 mA.cm^{-2}

V_{oc}=0,89V

Perhitungan

$FF=\frac{179\times0,58}{2,42\times0.89}\times100\%$

FF= 48,02%

3. Perhitungan Nilai PCE (FF)

Rumus: $PCE = FF\frac{J_{sc}\times V_{oc}}{P_{in}}$

$PCE=48,20\frac{2,42\times 0,89}{1,0}\times100\%$

PCE= 1%

A.2 Perhitungan *Band gap*

Rumus:

Persamaan Tauc:

$$(\alpha hv)^n=K(hv-Eg)$$

Perhitungan Nilai Energi

$$Eg=hv,\ hv=\frac{c}{\lambda}$$

$$Eg=\frac{6,62\times10^{-34}\times3\times10^8}{\lambda}$$

Mencari nilai α menggunakan hukum Lambert-beer

$$\frac{I}{I_0}=e^{-\alpha l}$$

$$\log\frac{I}{I_0}=\log(e^{-\alpha l})$$

$$A=\alpha L\times\log(e)$$

$$\alpha=\frac{A}{l\times\log(e)}$$

$$\alpha = \frac{A}{1 \times 0{,}4343}$$

$$\alpha = 2{,}303 \frac{A}{l}$$

Dimana:

α = koefisen absorbansi

h = konstanta plank

v = frekuensi

n = frekuensi foton (2 untuk direct *band gap*)

K = *energy independent constan*

Eg = *band gap*

c = kecepatan Cahaya

λ = panjang gelombang

A = nilai absorbansi

l = ketebalan lapisan

A.3 Perhitungan Ketebalan

Menggunakan metode swanpoel

Rumus: $d = \frac{\lambda_1 \lambda_2}{2(\lambda_1 n_1 - \lambda_2 n_2)}$

$$d = \frac{480 \times 410}{2(480 \times 1{,}56 - 410 \times 1{,}76)}$$

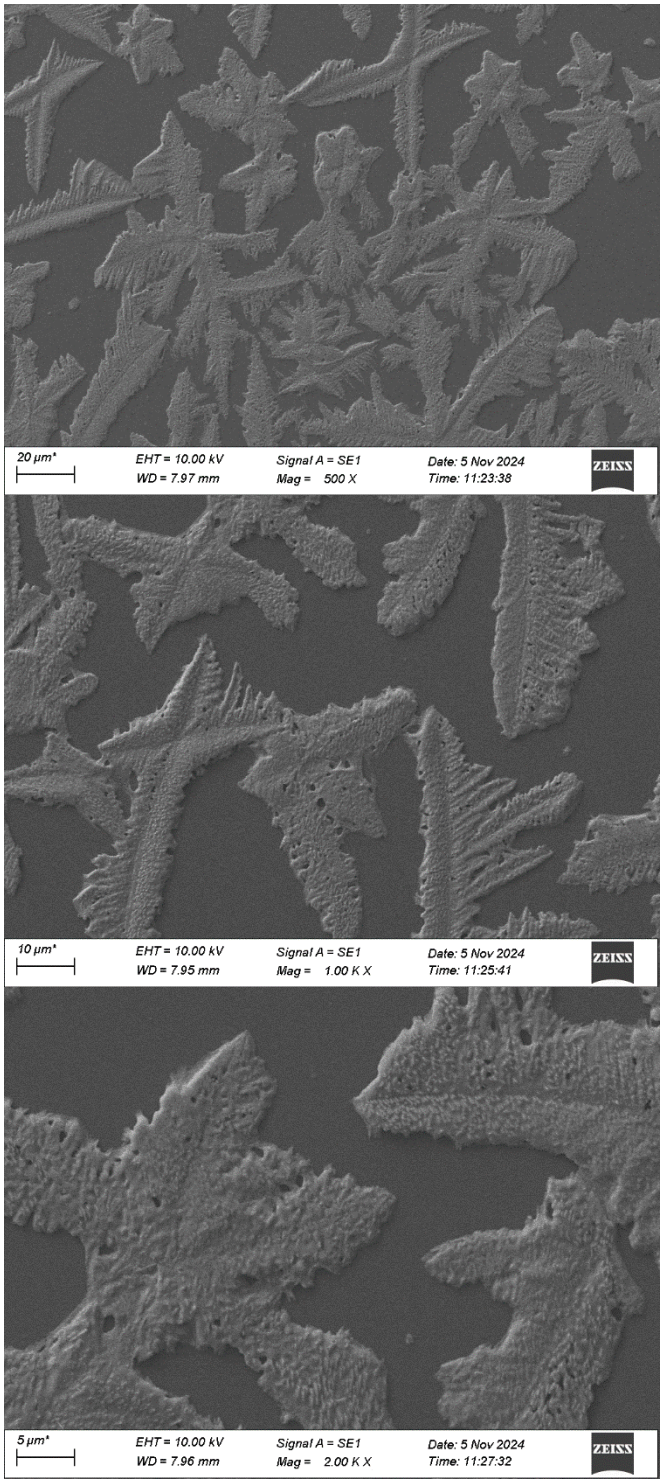
d=66.94

LAMPIRAN B

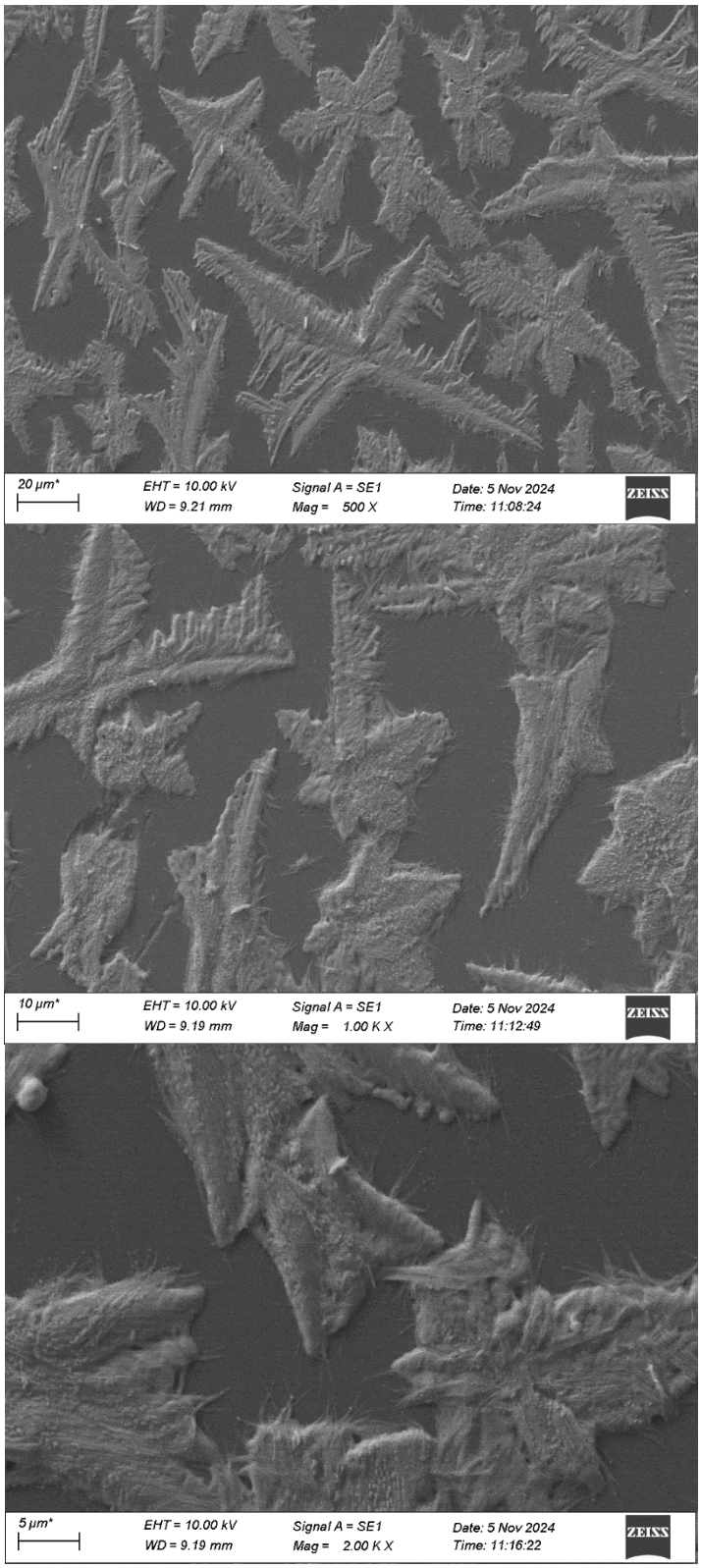
DATA PENELITIAN

Lampiran B. Data penelitian

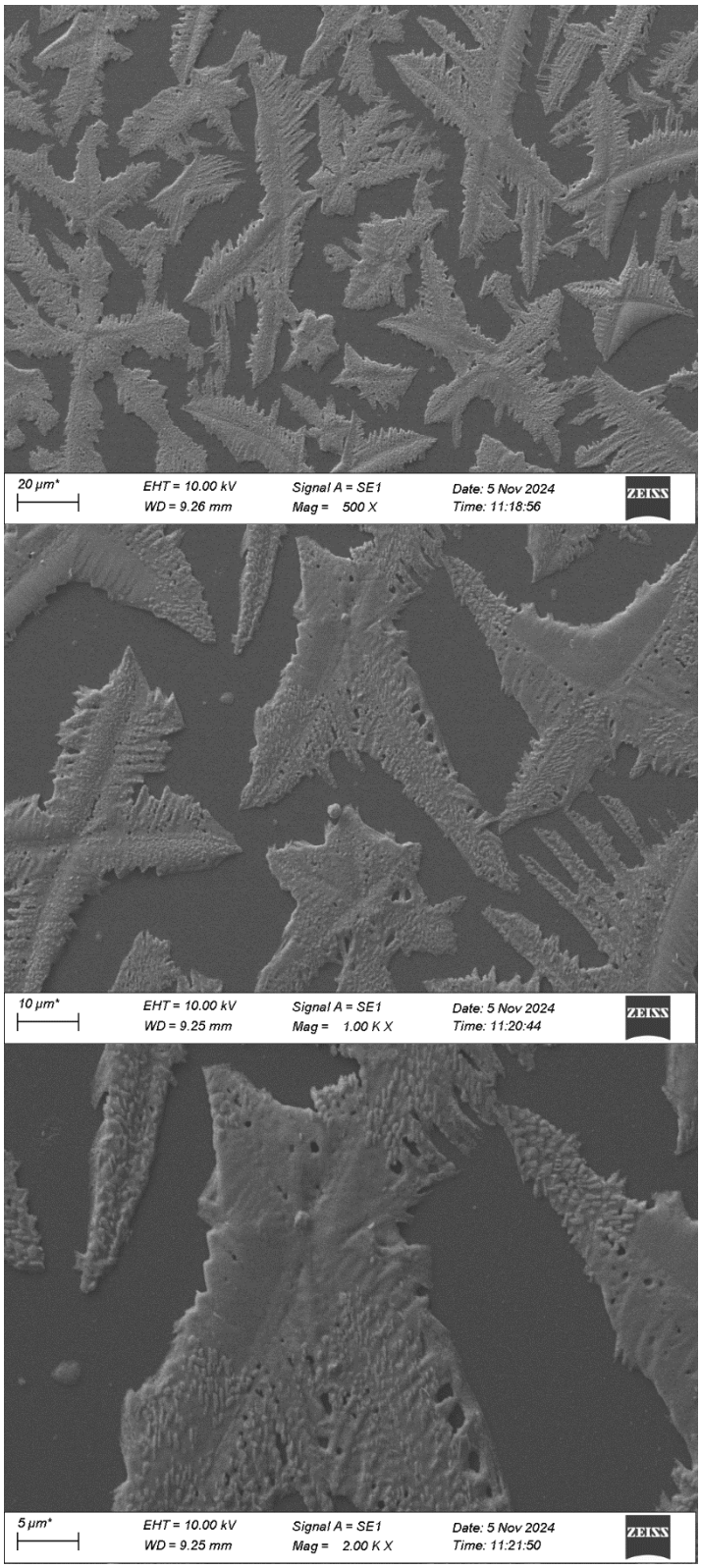
B.1 Data Pengujian SEM



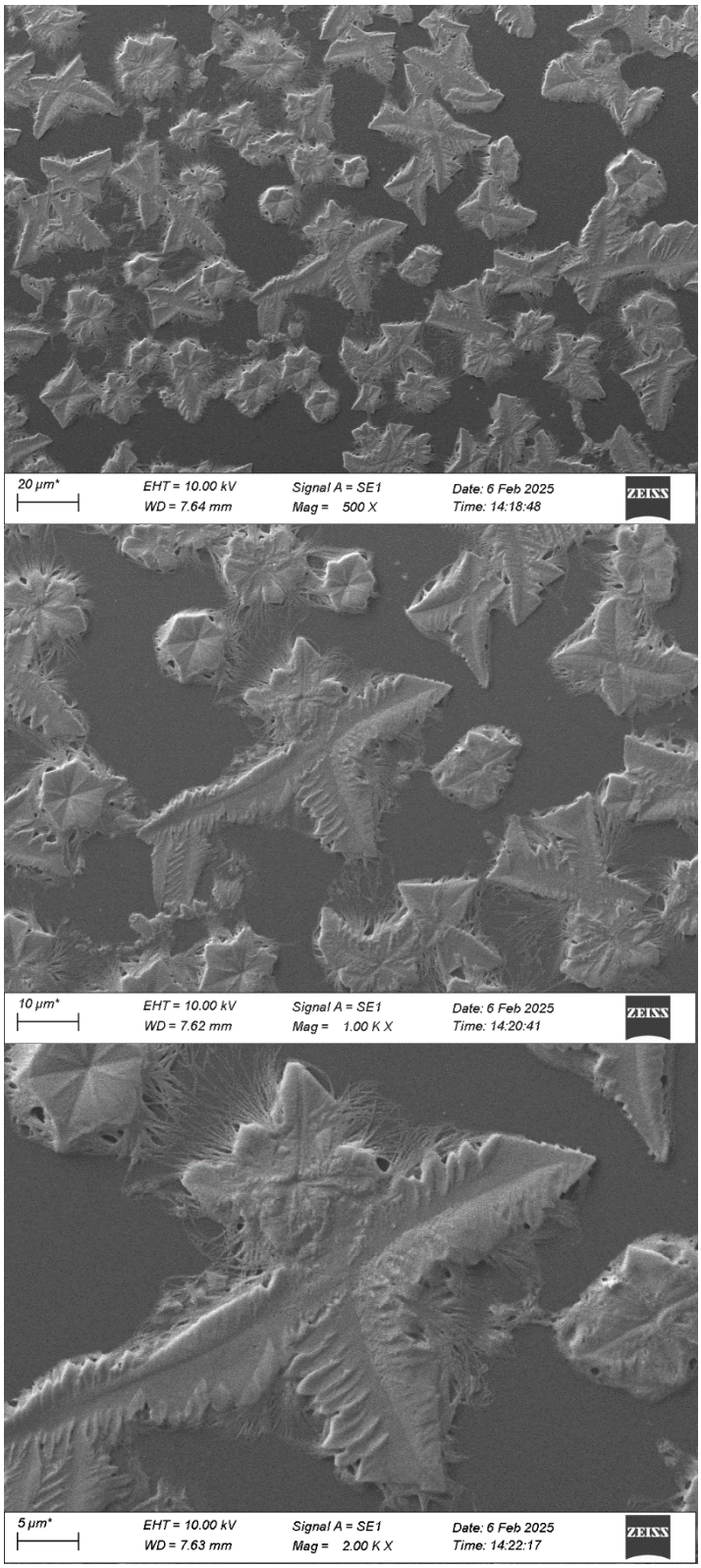
Gambar B.1 SEM Lapisan *Perovskite* 4000 rpm 20 detik



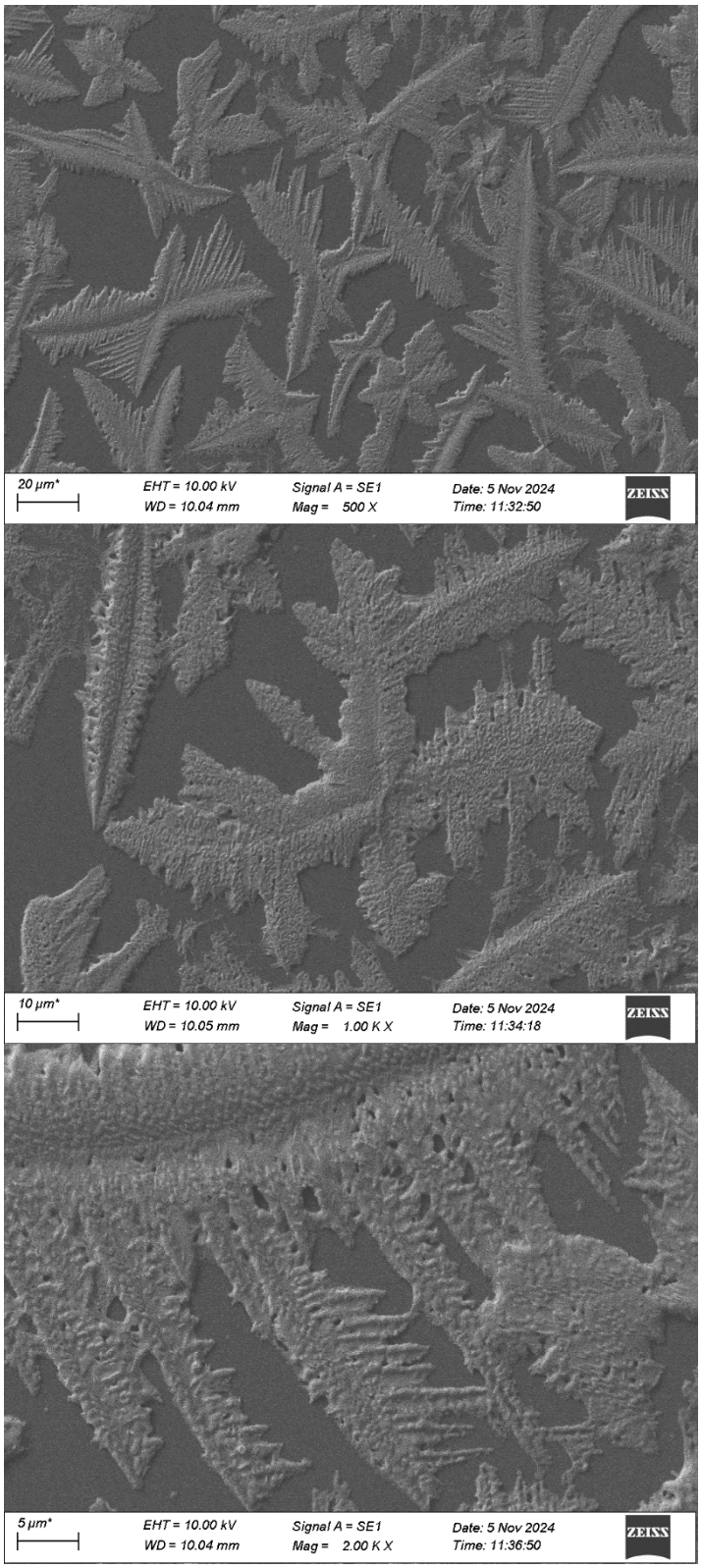
Gambar B.2 SEM Lapisan *Perovskite* 4000 rpm 30 detik



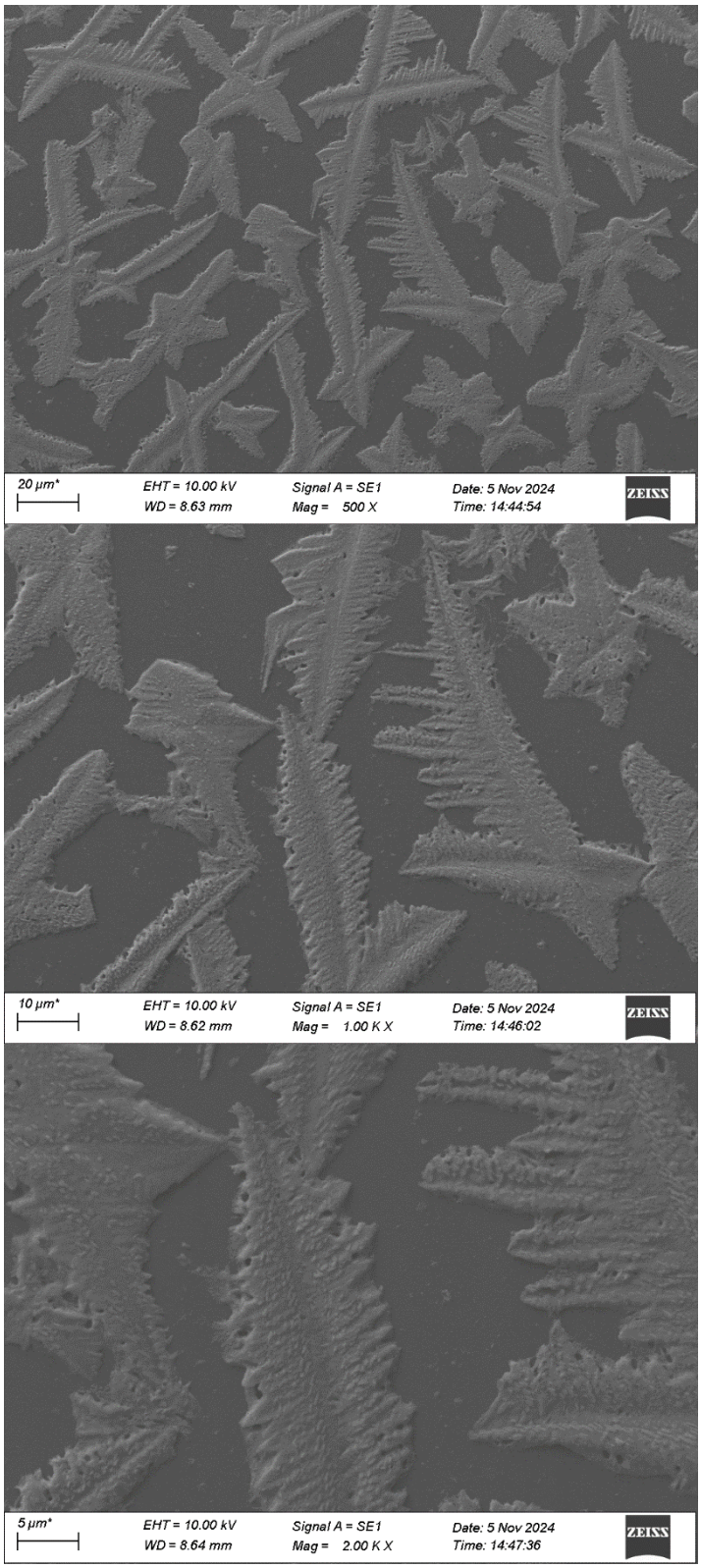
Gambar B.3 SEM Lapisan *Perovskite* 4000 rpm 40 detik



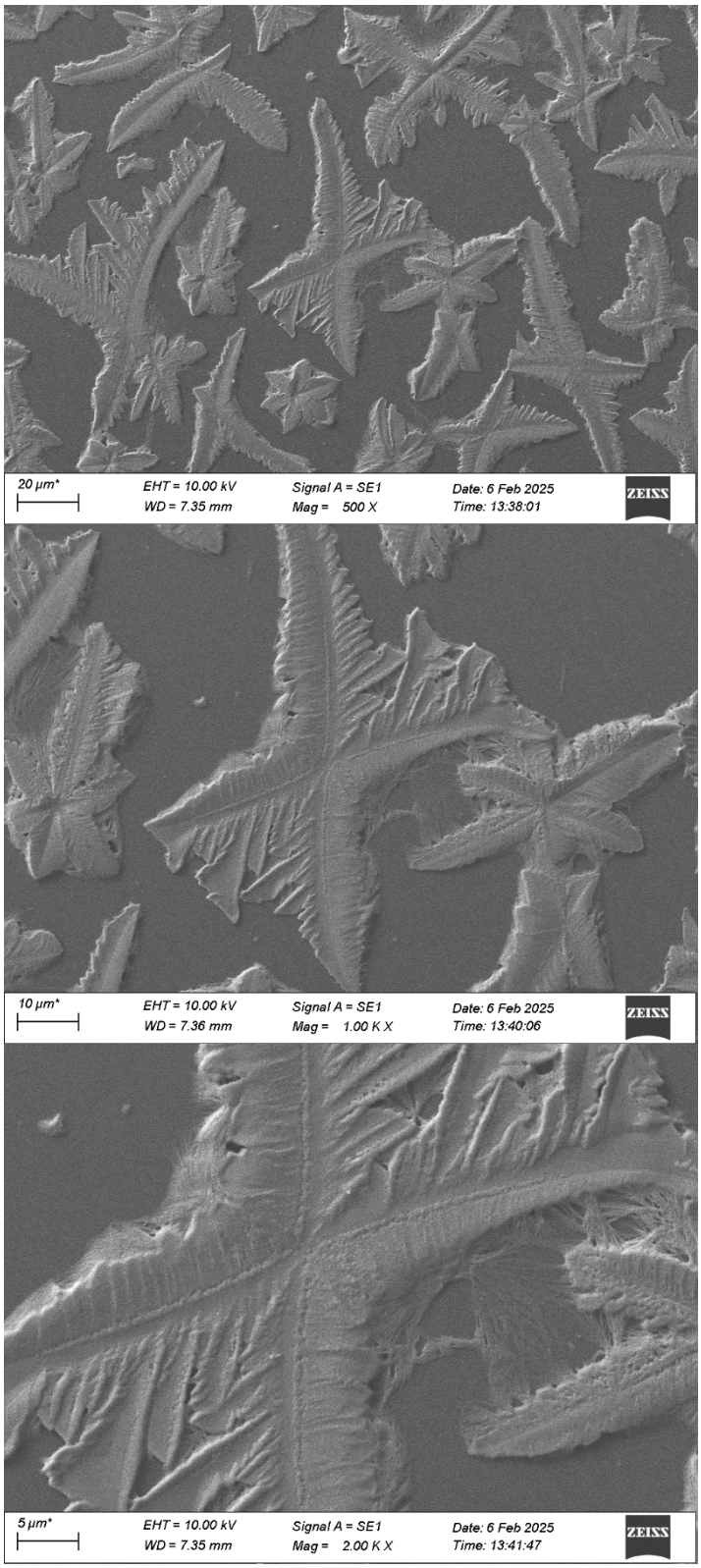
Gambar B.4 SEM Lapisan *Perovskite* 4500 rpm 20 detik



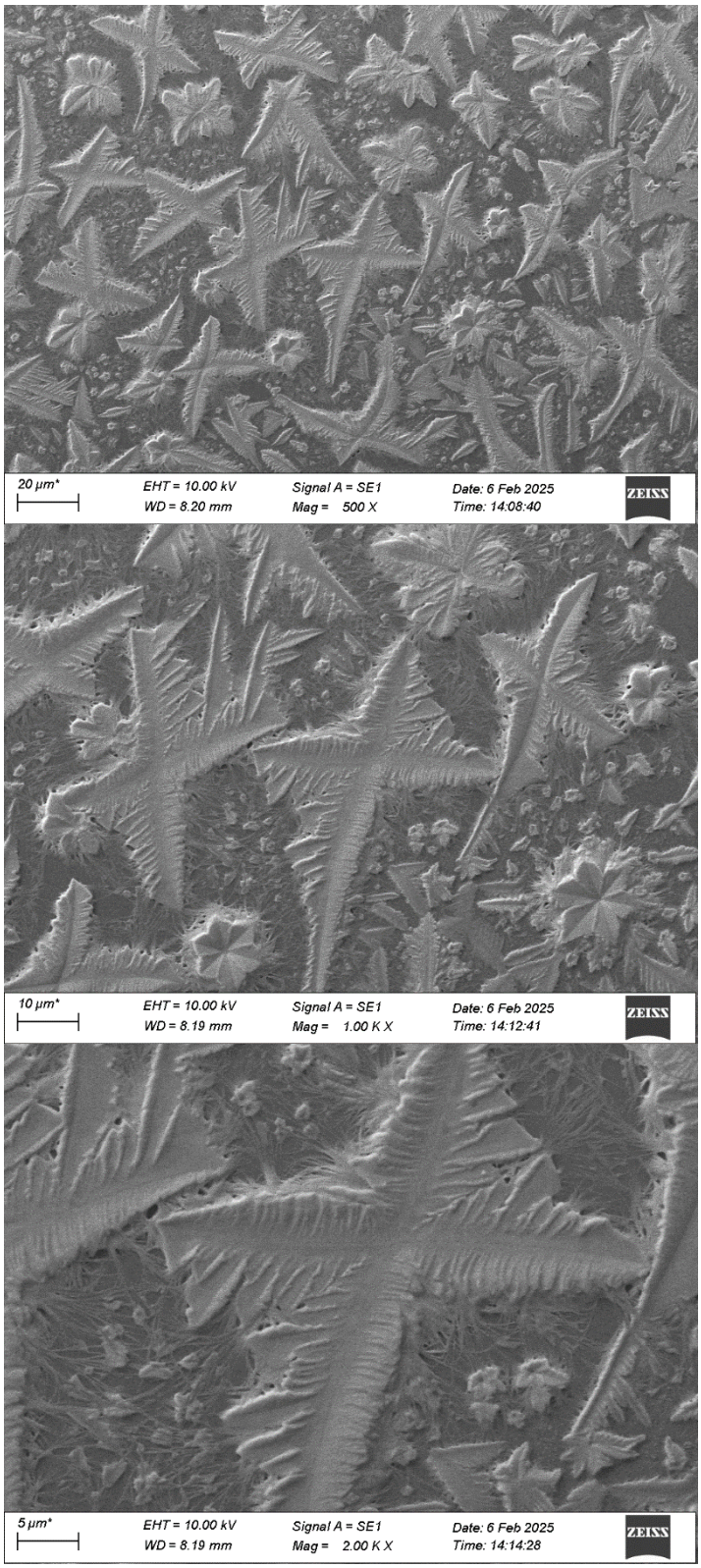
Gambar B.5 SEM Lapisan *Perovskite* 4500 rpm 30 detik



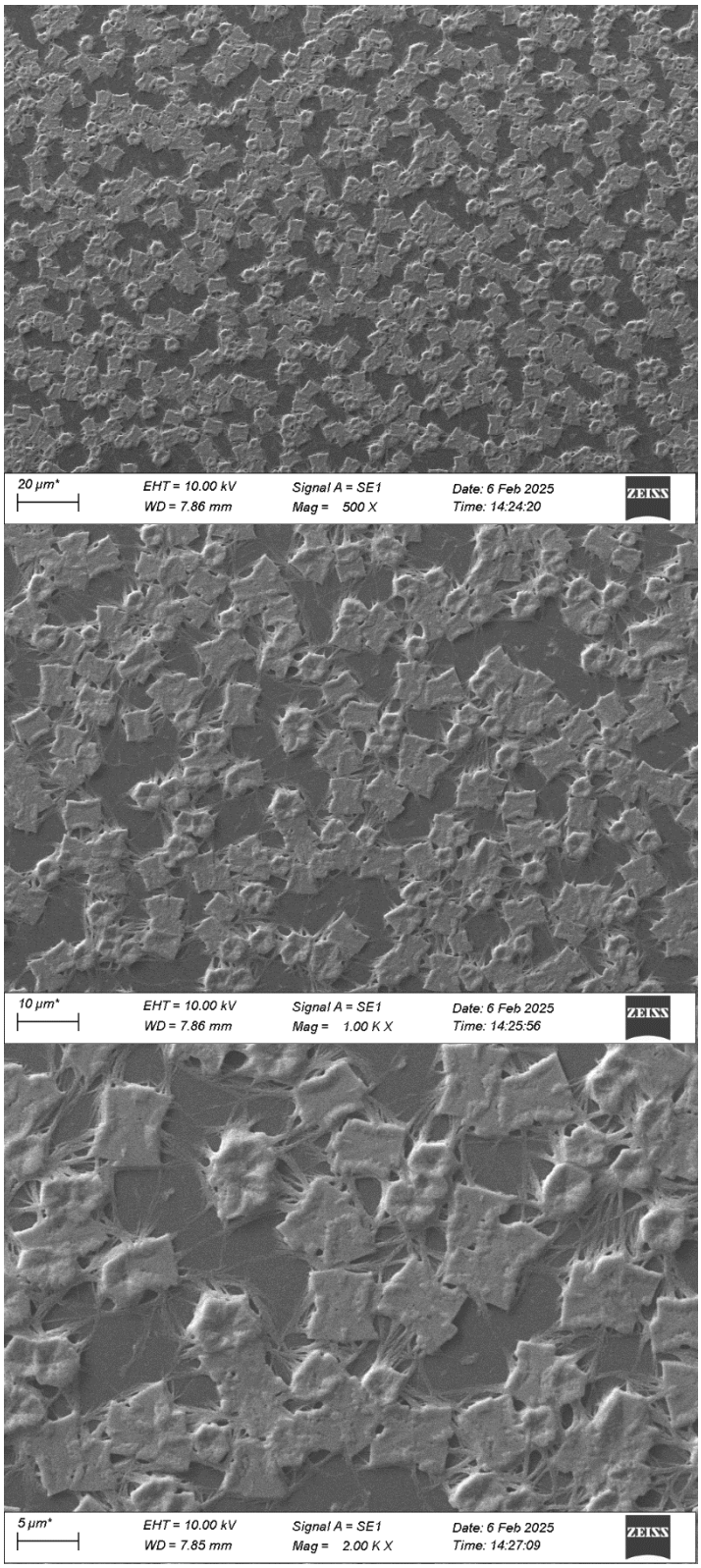
Gambar B.6 SEM Lapisan *Perovskite* 4500 rpm 40 detik



Gambar B.7 SEM Lapisan *Perovskite* 5000 rpm 20 detik

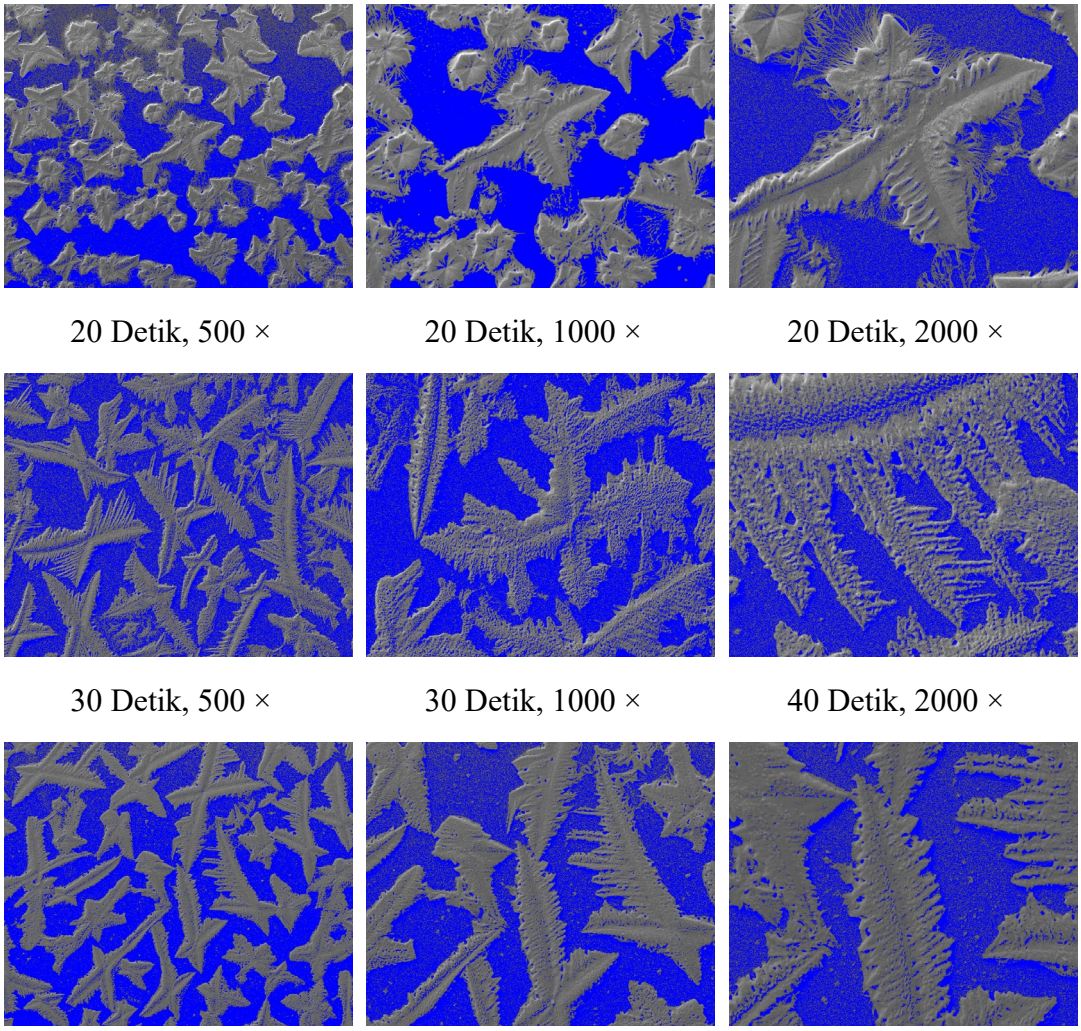


Gambar B.8 SEM Lapisan *Perovskite* 5000 rpm 30 detik



Gambar B.9 SEM Lapisan *Perovskite* 5000 rpm 40 detik

B.2 SEM Tiga Pembesaran setelah Dilakukan *Tresshold* pada *software* ImageJ



20 Detik, 500 × | 20 Detik, 1000 × | 20 Detik, 2000 ×

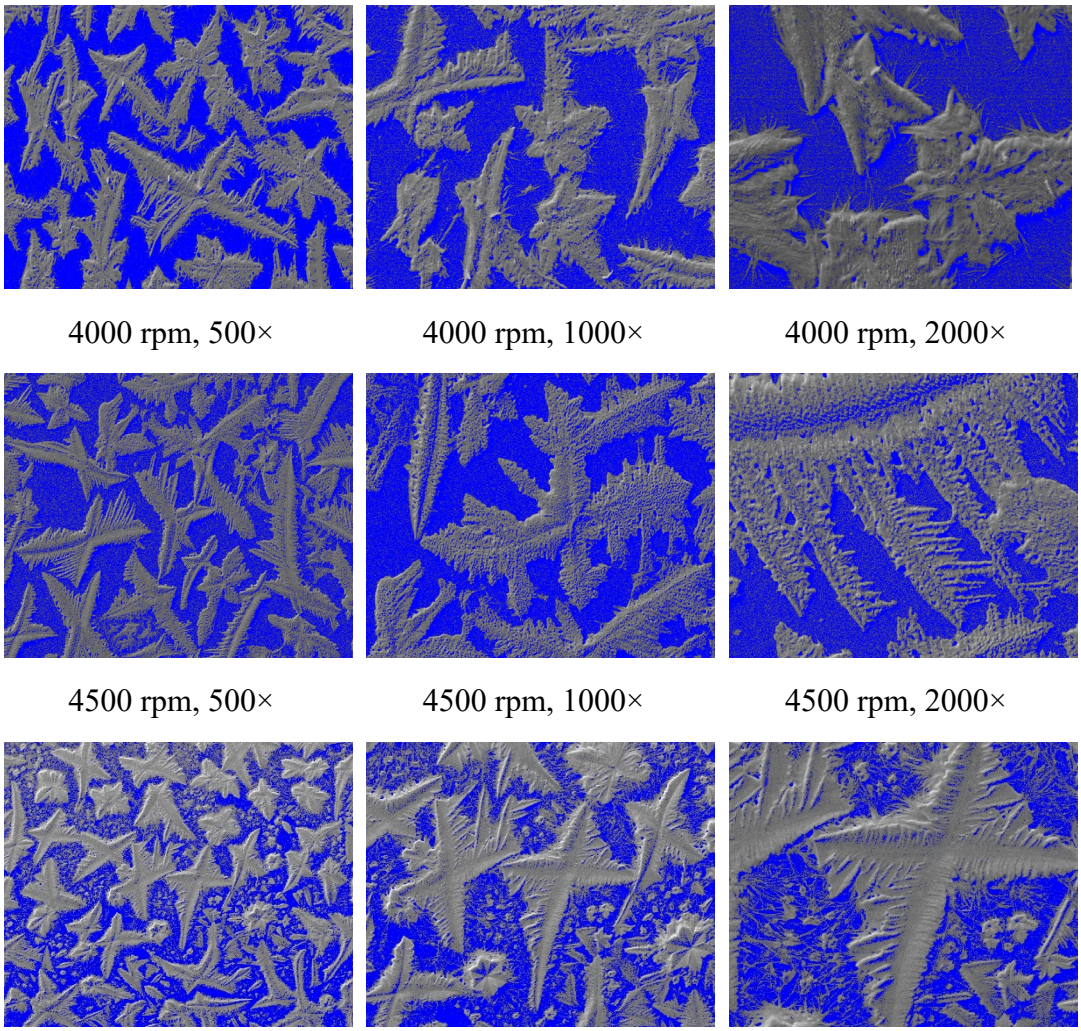
30 Detik, 500 × | 30 Detik, 1000 × | 40 Detik, 2000 ×

40 Detik, 500 × | 40 Detik, 1000 × | 40 Detik, 2000 ×

Gambar B.10 SEM Tiga Pembesaran setelah *Tresshold* Variasi Durasi Putar

Tabel B.1 Data Persen *Coverage* Variasi Durasi Putar

Durasi putar (Detik)	**% *Coverage***			
	Pembesaran 500×	**Pembesaran 1000×**	**Pembesaran 2000×**	**Rata-rata**
20	54,073	49,499	52,416	51,996
30	67,526	54,151	53,937	58,538
40	58,873	54,545	71,105	61,50767



4000 rpm, 500× 4000 rpm, 1000× 4000 rpm, 2000×

4500 rpm, 500× 4500 rpm, 1000× 4500 rpm, 2000×

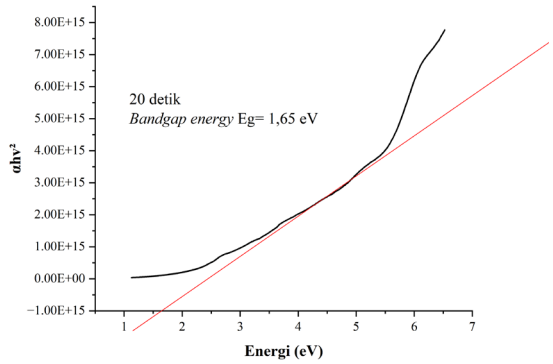
5000 rpm, 500× 5000 rpm, 1000× 5000 rpm, 2000×

Gambar B.11 SEM Tiga Pembesaran setelah *Tresshold* Variasi Kecepatan Putar

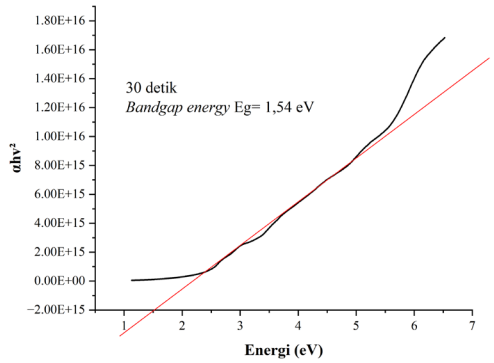
Tabel B.2 Data Persen *Coverage* Variasi Kecepatan Putar

Kecepatan putar (rpm)	**% *Coverage***			
	Pembesaran 500×	**Pembesaran 1000×**	**Pembesaran 2000×**	**Rata-rata**
4000	56,608	63,956	67,532	62,69867
4500	67,526	54,151	53,937	58,538
5000	72,044	69,48	69,806	70,44333

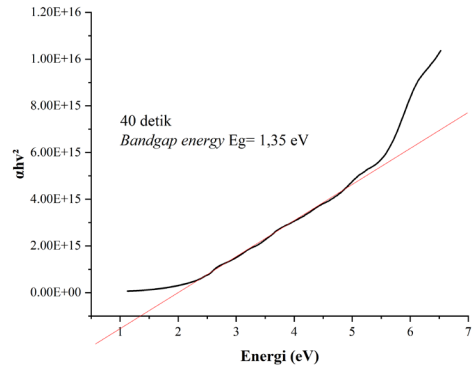
B.3 Data *Band gap*



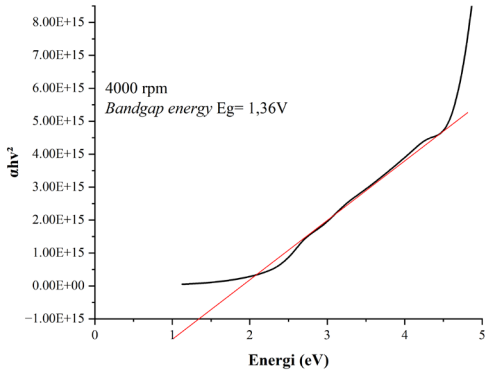
Gambar B.12 Grafik *Band gap* 20 Detik



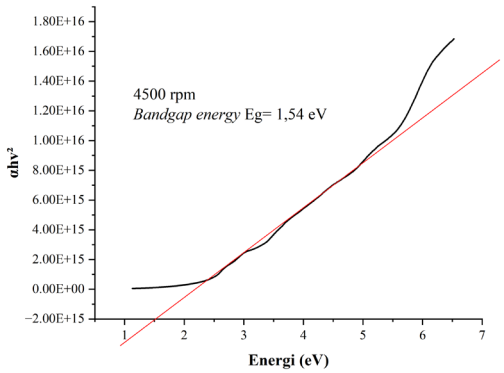
Gambar B.13 Grafik *Band gap* 30 Detik



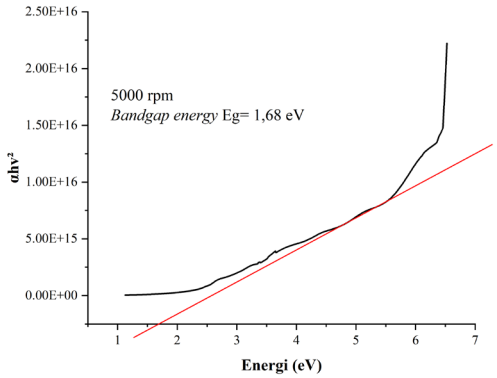
Gambar B. 14 Grafik *Band gap* 40 Detik



Gambar B.15 Grafik *Band gap* 4000 rpm



Gambar B.16 Grafik *Band gap* 4500 rpm



Gambar B.17 Grafik *Band gap* 5000 rpm

B.4 Data Karakterisasi IV

Tabel B.3 Data IV *Test* 20 detik 4000 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0,137664	27,13533	-2,06655	0,245493
2	0,008913	19,8746	-2,00108	0,022412
3	0	0	0	0
4	0	0	0	0
5	0,568704	89,44985	-2,05238	0,309777
6	2,343456	98,1539	-2,06082	1,158534
7	0,109799	25,40428	-2,05129	0,210701
8	0,033935	24,54782	-2,03651	0,067881

Tabel B.4 Data IV *Test* 30 detik 4000 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0,137664	27,13533	-2,06655	0,245493
2	0,008913	19,8746	-2,00108	0,022412
3	0	0	0	0
4	0	0	0	0
5	0,568704	89,44985	-2,05238	0,309777
6	2,343456	98,1539	-2,06082	1,158534
7	0,109799	25,40428	-2,05129	0,210701
8	0,033935	24,54782	-2,03651	0,067881

Tabel B.5 Data IV *Test* 40 detik 4000 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0,0990	25,3329	-2,2869	0,1709
2	1,0418	59,4675	-2,2878	0,7657
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	1,8726	109,9216	-2,2871	0,7449
7	0	0	0	0
8	1,8379	80,8402	-2,2959	0,9902

Tabel B.6 Data IV *Test* 20 detik 4500 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0,858897	33,23254	-2,21779	1,165355
5	0,025815	22,44214	-2,14688	0,05358
6	0,023137	21,35791	-2,15989	0,050155
7	0	0	0	0
8	0	0	0	0

Tabel B.7 Data IV *Test* 30 detik 4500 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0,016991	24,89649	-1,99226	0,034257
2	0	0	0	0
3	0	0	0	0
4	0,019503	24,78852	-2,31168	0,034035
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	2,125156	98,19756	-2,36306	0,915832

Tabel B.8 Data IV *Test* 40 detik 4500 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	1,04378	74,07282	-2,3534	0,598761
2	0,037681	24,60706	-2,33765	0,065506
3	0	0	0	0
4	2,496961	98,09268	-2,33815	1,088684
5	0,004308	12,44638	-2,22723	0,015542
6	0	0	0	0
7	0,01839	24,74374	-2,29729	0,032353
8	0,004308	12,44638	-2,22723	0,015542

Tabel B.9 Data IV *Test* 20 detik 5000 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0,037001	24,80397	-2,24651	0,066402
2	0,050934	23,97049	-2,24693	0,094567
3	0,008757	18,63057	-2,15159	0,021847
4	0,015952	24,4361	-2,19723	0,02971
5	0,054538	24,80223	-2,24987	0,097735
6	0,283452	59,22935	-2,29701	0,208343
7	0	0	0	0
8	0,056329	21,98409	-1,67364	0,064826

Tabel B.10 Data IV *Test* 30 detik 5000 rpm

Pixel	PCE%	FF%	Jsc (mA.cm^{-2})	Voc
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0,013925	22,44667	-2,33946	0,026517
5	1,227998	55,31019	-2,36788	0,937634
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0

Tabel B.11 Data IV *Test* 40 detik 5000 rpm

Pixel	PCE%	FF%	Jsc (mA,cm^{-2})	Voc
1	0,211	48,588	-2,664	0,163
2	0,515	32,339	-2,671	0,596
3	0,192	22,125	-2,624	0,330
4	0	0	0	0
5	0,400	27,358	-2,658	0,551
6				
7	1,654	56,841	-2,656	1,096
8	0	0	0	0

Tabel B.12 Data lengkap hasil pengukuran IV

Kecepatan (rpm)	Durasi (detik)	Rata-rata PCE (%)	Rata-rata FF (%)	J_{sc} (mA. cm$^{-2)}$	V_{oc} (V)	PCE Terbaik (%)
	40	0,594	37,450	-2,655	0,547	1,654
5000	30	0,469	36,409	-2,360	0,401	1,228
	20	0,075	29,312	-2,232	0,086	0,283
	40	0,601	41,068	-2,297	0,303	2,497
4500	30	0,498	39,273	-2,149	0,330	2,125
	20	0,303	25,678	-2,175	0,423	0,859
	40	1,004	64,907	-2,287	0,561	1,873
4000	30	0,534	47,428	-2,045	0,336	2,343
	20	0,282	32,244	-2,216	0,307	1,225

B.5 Data XRD

Name and formula

Reference code: 96-413-4352

Compound name: 4134351
Common name: 4134351

Chemical formula: $Pb_{2.00}I_{8.00}Br_{4.00}N_{4.00}H_{36.00}C_{28.00}$

Crystallographic parameters

Crystal system: Monoclinic
Space group: P 1 21 1
Space group number: 4

a (Å): 8.6330
b (Å): 8.9480
c (Å): 15.9330
Alpha (°): 90.0000
Beta (°): 95.5590
Gamma (°): 90.0000

Calculated density (g/cm^3): 2.95
Volume of cell (10^6 pm^3): 1225.01
RIR: 67.28

Subfiles and Quality

Subfiles: User Organic
Quality: None ( )

Comments

Creation Date: 5/6/2024 09:34:37
Modification Date: 5/6/2024 09:34:37
Crystal color: orange
Crystal description: lath
Structure TIDY: TRANS Origin 0 .31470 1/2
Publication title: Control of crystal symmetry breaking with halogen substituted benzylammonium in layered hybrid metal-halide *perovskite*s.
COD database code: 4134351

References

Structure: Schmitt, Tanja, Bourelle, Sean, Tye, Nathaniel, Soavi, Giancarlo, Bond, Andrew D., Feldmann, Sascha, Traore,

Peak list

No.	h	k	l	d [A]	2Theta[deg]	I [%]
1	0	0	1	15.85807	5.568	100.0
2	1	0	0	8.59240	10.287	0.4
3	0	0	2	7.92903	11.150	26.0
4	-1	0	1	7.88126	11.218	0.0
5	0	1	1	7.79301	11.345	1.5
6	1	0	1	7.26565	12.172	0.1
7	1	1	0	6.19765	14.279	41.4
8	-1	0	2	6.13059	14.436	0.0
9	0	1	2	5.93438	14.916	0.1
10	-1	1	1	5.91427	14.967	12.2
11	1	1	1	5.64039	15.699	10.0
12	1	0	2	5.56463	15.914	0.3
13	0	0	3	5.28602	16.758	3.9
14	-1	1	2	5.05744	17.522	0.8
15	1	1	2	4.72540	18.764	2.0
16	-1	0	3	4.71051	18.823	0.0
17	0	1	3	4.55120	19.489	0.1
18	0	2	0	4.47400	19.828	14.1
19	1	0	3	4.31939	20.546	0.1
20	0	2	1	4.30591	20.611	0.3
21	2	0	0	4.29620	20.658	4.0
22	-2	0	1	4.25198	20.875	5.0
23	-1	1	3	4.16822	21.299	0.2
24	2	0	1	4.04891	21.935	0.0
25	1	2	0	3.96828	22.386	8.1
26	0	0	4	3.96452	22.408	12.2
27	-2	0	2	3.94063	22.545	1.7
28	0	2	2	3.89650	22.804	2.0
29	-1	2	1	3.89079	22.838	0.4
30	1	1	3	3.88989	22.843	0.7
31	2	1	0	3.87293	22.945	2.2
32	-2	1	1	3.84044	23.141	9.1
33	1	2	1	3.80966	23.331	2.8
34	-1	0	4	3.74028	23.770	0.4
35	2	1	1	3.68884	24.106	0.5
36	2	0	2	3.63282	24.484	3.3
37	0	1	4	3.62468	24.540	3.2
38	-1	2	2	3.61397	24.613	1.9
39	-2	1	2	3.60639	24.666	9.2
40	-2	0	3	3.50422	25.397	3.0
41	1	2	2	3.48678	25.526	4.4
42	1	0	4	3.47407	25.621	0.0
43	-1	1	4	3.45093	25.796	2.4
44	0	2	3	3.41500	26.072	5.2
45	2	1	2	3.36599	26.458	0.9
46	-2	1	3	3.26293	27.310	4.4
47	-1	2	3	3.24399	27.473	3.4
48	1	1	4	3.23854	27.520	10.3
49	2	0	3	3.18629	27.980	2.3
50	0	0	5	3.17161	28.112	20.4
51	1	2	3	3.10749	28.705	0.8

52	2	2	0	3.09882	28.787	24.5
53	-2	2	1	3.08210	28.946	13.4
54	-1	0	5	3.07369	29.027	0.6
55	-2	0	4	3.06529	29.109	0.6
56	2	2	1	3.00207	29.736	5.9
57	0	1	5	2.98938	29.865	0.5
58	0	2	4	2.96719	30.093	0.7
59	-2	2	2	2.95713	30.198	1.8
60	0	3	1	2.93127	30.471	3.0
61	-1	1	5	2.90696	30.732	9.3
62	-2	1	4	2.89986	30.809	1.9
63	1	0	5	2.88596	30.961	0.0
64	-1	2	4	2.86959	31.142	2.5
65	-3	0	1	2.86754	31.165	0.4
66	3	0	0	2.86413	31.203	0.1
67	2	2	2	2.82020	31.702	1.3
68	1	3	0	2.81773	31.731	10.6
69	0	3	2	2.79168	32.035	0.1
70	-1	3	1	2.78958	32.059	5.9
71	2	0	4	2.78231	32.145	1.0
72	-3	0	2	2.78124	32.158	0.1
73	3	0	1	2.77196	32.269	0.4
74	1	3	1	2.75922	32.422	2.2
75	-2	2	3	2.75874	32.427	0.5
76	1	1	5	2.74663	32.574	6.4
77	1	2	4	2.74396	32.607	0.1
78	-3	1	1	2.73074	32.769	4.5
79	3	1	0	2.72780	32.806	12.4
80	-1	3	2	2.68208	33.381	1.2
81	-2	0	5	2.67862	33.425	1.2
82	2	1	4	2.65684	33.708	1.5
83	-3	1	2	2.65590	33.720	1.5
84	3	1	1	2.64782	33.826	2.0
85	0	0	6	2.64301	33.889	3.7
86	1	3	2	2.62884	34.078	1.0
87	-3	0	3	2.62709	34.101	0.0
88	3	0	2	2.61408	34.276	0.2
89	-1	0	6	2.59791	34.496	0.3
90	2	2	3	2.59537	34.531	1.2
91	0	2	5	2.58742	34.640	3.1
92	-2	1	5	2.56611	34.937	1.4
93	0	1	6	2.53475	35.384	0.2
94	-1	2	5	2.53342	35.403	1.1
95	-2	2	4	2.52872	35.471	3.7
96	-3	1	3	2.52069	35.587	0.1
97	-1	3	3	2.51997	35.598	1.1
98	3	1	2	2.50919	35.756	0.3
99	-1	1	6	2.49489	35.968	1.5
100	1	0	6	2.46012	36.494	0.0
101	1	3	3	2.45437	36.583	0.1
102	2	3	0	2.45009	36.649	0.8
103	-2	3	1	2.44180	36.778	0.2
104	2	0	5	2.44113	36.788	0.3
105	-3	0	4	2.43639	36.862	0.0
106	1	2	5	2.42518	37.039	2.3
107	3	0	3	2.42188	37.091	0.0
108	-3	2	1	2.41422	37.213	1.1
109	3	2	0	2.41219	37.246	0.3
110	2	3	1	2.40142	37.419	1.2

111	0	3	4	2.38345	37.711	1.9
112	-2	3	2	2.37823	37.797	0.2
113	1	1	6	2.37210	37.899	0.9
114	2	2	4	2.36270	38.055	8.5
115	-3	2	2	2.36204	38.066	0.5
116	3	2	1	2.35635	38.162	0.3
117	-2	0	6	2.35526	38.180	0.7
118	-3	1	4	2.35080	38.255	1.6
119	3	1	3	2.33777	38.477	0.5
120	-1	3	4	2.33198	38.576	3.1
121	2	3	2	2.30523	39.042	0.9
122	-2	2	5	2.29821	39.166	6.8
123	-2	1	6	2.27768	39.534	1.1
124	0	2	6	2.27560	39.572	0.1
125	-2	3	3	2.27131	39.649	0.5
126	0	0	7	2.26544	39.756	1.3
127	1	3	4	2.26303	39.801	2.2
128	3	2	2	2.25705	39.910	0.3
129	-1	2	6	2.24662	40.104	0.0
130	-1	0	7	2.24484	40.137	0.0
131	0	4	0	2.23700	40.284	1.7
132	-3	0	5	2.23614	40.300	0.1
133	3	0	4	2.22173	40.573	0.1
134	0	4	1	2.21507	40.700	2.0
135	0	1	7	2.19615	41.066	0.4
136	2	3	3	2.17749	41.434	0.3
137	0	3	5	2.17279	41.528	0.1
138	-3	1	5	2.16942	41.596	6.0
139	1	4	0	2.16484	41.688	0.5
140	2	0	6	2.15970	41.792	0.2
141	-4	0	1	2.15663	41.854	1.3
142	3	1	4	2.15626	41.861	3.3
143	1	2	6	2.15571	41.873	0.5
144	0	4	2	2.15296	41.929	0.3
145	-1	4	1	2.15199	41.948	4.4
146	4	0	0	2.14810	42.028	2.7
147	2	2	5	2.14290	42.135	5.9
148	-1	3	5	2.14052	42.184	5.3
149	1	0	7	2.14007	42.193	0.0
150	-3	2	4	2.13969	42.201	0.6
151	1	4	1	2.13796	42.237	0.3
152	-2	3	4	2.13768	42.243	1.3
153	3	2	3	2.12985	42.405	0.5
154	-4	0	2	2.12599	42.486	0.1
155	4	0	1	2.10175	43.000	0.1
156	-1	4	2	2.10147	43.006	1.3
157	2	1	6	2.09941	43.051	0.3
158	-4	1	1	2.09659	43.111	0.6
159	-2	0	7	2.08914	43.273	0.0
160	4	1	0	2.08875	43.281	1.8
161	-2	2	6	2.08411	43.383	2.9
162	1	1	7	2.08137	43.443	0.3
163	1	4	2	2.07557	43.570	0.3
164	1	3	5	2.07403	43.604	2.7
165	-4	1	2	2.06841	43.729	1.1
166	-3	3	1	2.06716	43.757	0.3
167	3	3	0	2.06588	43.785	0.5
168	-4	0	3	2.06090	43.896	0.0
169	0	4	3	2.06012	43.914	0.2

170	4	1	1	2.04607	44.231	1.1
171	-3	0	6	2.04353	44.289	0.2
172	-2	1	7	2.03443	44.498	1.5
173	-3	3	2	2.03412	44.505	0.3
174	3	3	1	2.03048	44.589	0.0
175	3	0	5	2.03009	44.598	0.1
176	4	0	2	2.02445	44.729	0.2
177	0	2	7	2.02110	44.807	0.1
178	-1	4	3	2.02071	44.816	0.3
179	-4	1	3	2.00832	45.108	0.6
180	-1	2	7	2.00644	45.153	0.0
181	-3	2	5	2.00022	45.301	0.1
182	-2	3	5	1.99292	45.476	0.5
183	-3	1	6	1.99224	45.493	2.2
184	3	2	4	1.98989	45.549	0.7
185	1	4	3	1.98641	45.633	2.1
186	2	4	0	1.98414	45.689	2.5
187	0	0	8	1.98226	45.734	0.0
188	3	1	5	1.97978	45.795	2.7
189	0	3	6	1.97812	45.835	0.5
190	4	1	2	1.97455	45.923	0.7
191	-1	0	8	1.97386	45.940	0.1
192	-3	3	3	1.97142	46.000	0.6
193	-4	0	4	1.97031	46.028	0.0
194	3	3	2	1.96591	46.137	0.2
195	-1	3	6	1.95900	46.309	2.7
196	2	4	1	1.95803	46.333	0.5
197	0	4	4	1.94825	46.579	1.9
198	-2	4	2	1.94540	46.652	0.1
199	2	2	6	1.94495	46.663	3.1
200	-4	2	1	1.94271	46.720	1.6
201	4	2	0	1.93646	46.880	2.3
202	0	1	8	1.93534	46.909	0.5
203	1	2	7	1.93057	47.031	1.2

Name and formula

Reference code:	96-400-3376
Compound name:	4003375
Common name:	4003375
Chemical formula:	$Pb_{56.22}I_{61.92}$

Crystallographic parameters

Crystal system:	Cubic
Space group:	P -4 3 m
Space group number:	215
a (Å):	23.2900
b (Å):	23.2900
c (Å):	23.2900
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	90.0000
Calculated density (g/cm^3):	2.56
Volume of cell (10^6 pm^3):	12633.06
RIR:	39.92

Subfiles and Quality

Subfiles:	User Inorganic
Quality:	None ( )

Comments

Creation Date:	5/6/2024 00:06:06
Modification Date:	5/6/2024 00:06:06

Structure TIDY: TRANS Origin 1/2 1/2 1/2
Publication title: Solution Processing of Methylammonium Lead Iodide *Perovskite* from g-Butyrolactone: Crystallization Mediated by Solvation Equilibrium
COD database code: 4003375

References

Structure: Fateev, Sergey A., Petrov, Andrey A., Khrustalev, Victor N., Dorovatovskii, Pavel V., Zubavichus, Yan V., Goodilin, Eugene A., Tarasov, Alexey B., *Chemistry of Materials*, **30**, 5237, (2018)

Peak list

No.	h	k	l	d [A]	2Theta[deg]	I [%]
1	0	1	0	23.29000	3.791	1.0
2	0	1	1	16.46852	5.362	100.0
3	1	1	1	13.44649	6.568	0.2
4	0	2	0	11.64500	7.586	5.1
5	0	2	1	10.41560	8.483	0.0
6	1	2	1	9.50810	9.294	4.9
7	0	2	2	8.23426	10.736	1.0
8	1	2	2	7.76333	11.389	1.2
9	0	3	1	7.36494	12.007	0.0
10	1	3	1	7.02220	12.595	0.6
11	2	2	2	6.72324	13.158	0.1
12	0	3	2	6.45948	13.698	0.0
13	1	3	2	6.22451	14.217	0.1
14	0	4	0	5.82250	15.205	0.4
15	2	3	2	5.64865	15.676	2.3
16	1	4	1	5.48951	16.133	0.3
17	1	3	3	5.34309	16.578	0.2
18	0	4	2	5.20780	17.012	0.0
19	1	4	2	5.08229	17.435	0.0
20	2	3	3	4.96544	17.849	0.1
21	2	4	2	4.75405	18.650	0.0
22	0	5	0	4.65800	19.038	0.0
23	0	5	1	4.56754	19.418	0.1
24	1	5	1	4.48216	19.792	0.1
25	2	4	3	4.32484	20.519	1.1
26	1	5	2	4.25215	20.874	1.0
27	0	4	4	4.11713	21.567	0.0
28	2	5	2	4.05427	21.905	0.1
29	3	4	3	3.99420	22.239	0.0
30	1	5	3	3.93673	22.568	0.0
31	0	6	0	3.88167	22.892	7.9
32	0	6	1	3.82885	23.212	0.0
33	1	6	1	3.77814	23.528	0.3
34	0	6	2	3.68247	24.149	0.0
35	3	4	4	3.63729	24.453	1.1
36	1	5	4	3.59372	24.754	0.1
37	3	5	3	3.55169	25.052	0.1
38	2	6	2	3.51110	25.346	0.4
39	2	5	4	3.47187	25.638	0.2
40	1	6	3	3.43392	25.926	0.2
41	4	4	4	3.36162	26.494	0.0
42	2	6	3	3.32714	26.773	0.0
43	0	7	1	3.29370	27.050	18.1
44	1	5	5	3.26125	27.324	0.0
45	0	6	4	3.22974	27.596	0.0
46	0	7	2	3.19913	27.866	0.1
47	1	7	2	3.16937	28.133	0.0
48	2	6	4	3.11226	28.660	0.0
49	4	5	4	3.08484	28.920	0.1
50	0	7	3	3.05813	29.178	0.1
51	3	5	5	3.03210	29.434	0.0
52	0	6	5	2.98198	29.941	0.0

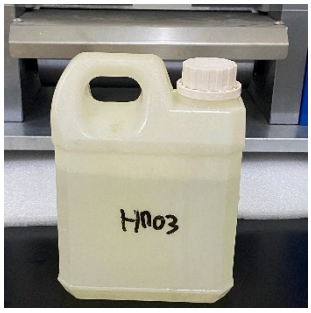
LAMPIRAN C

GAMBAR ALAT DAN BAHAN

Lampiran C. Gambar Alat dan Bahan

Gambar C.1 Air Deionisasi

Gambar C.2 Ag *Paste*

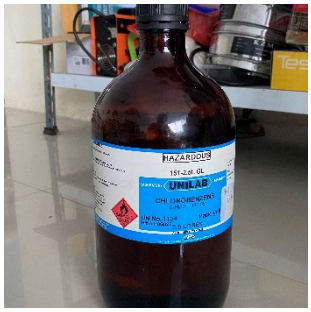


Gambar C.3 Asam Nitrat

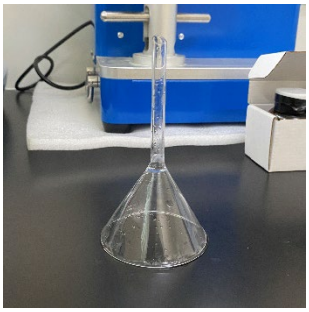
Gambar C.4 Aseton

Gambar C.5 Asetonitril

Gambar C.6 Botol Kaca

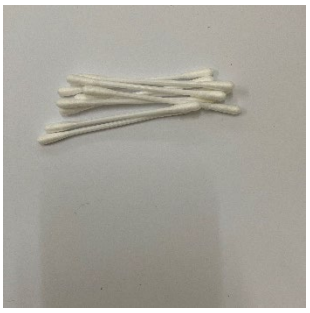


Gambar C.7 Chlorobenzene



Gambar C.8 Corong

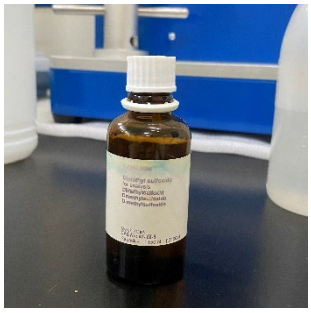
Gambar C.9 *Cutter*



Gambar C.10 *Cotton Bud*

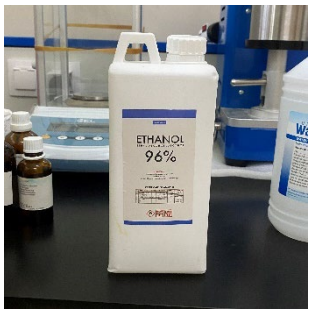
Gambar C.11 Detergen

Gambar C.12 DMF

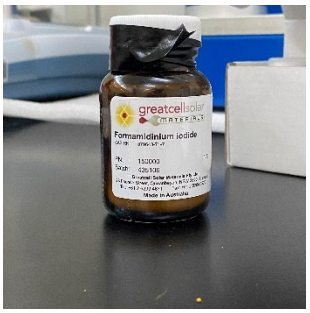


Gambar C.13 DMSO

Gambar C.14 *Dry Cabinet*



Gambar C.15 Etanol

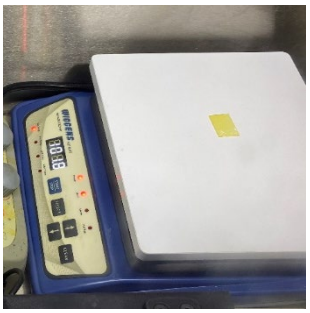


Gambar C.16 FAI

Gambar C.17 Gas Nitrogen

Gambar C.18 Gelas Beker

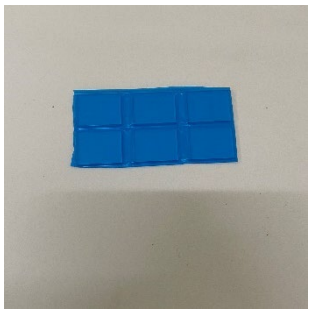
Gambar C.19 *Glove Box*



Gambar C.20 *Hot Plate*

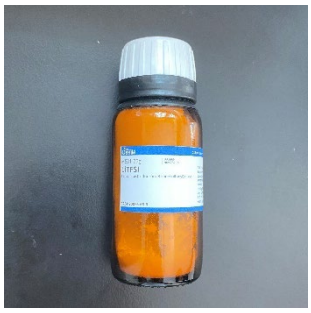
Gambar C.21 Hygrometer

Gambar C.22 Isopropanol



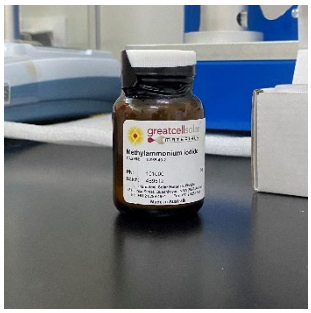
Gambar C.23 ITO *Glass*

Gambar C.24 Kaca Arloji



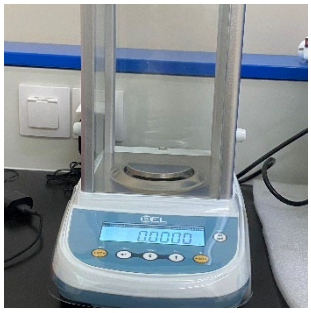
Gambar C.25 Li-TFSI

Gambar C.26 *Magnetic Stirrer*

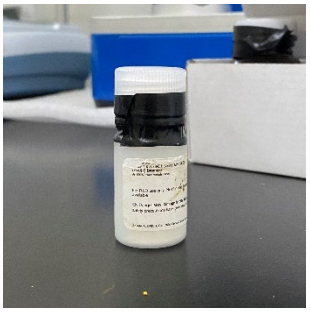


Gambar C.27 MAI

Gambar C.28 Mikropipet 10-100 µl



Gambar C.29 Neraca Digital

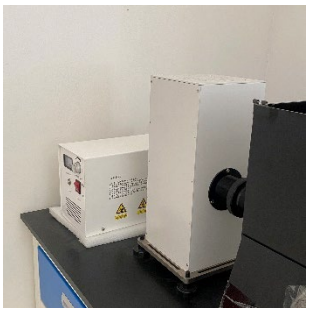


Gambar C.30 $PbBr_2$

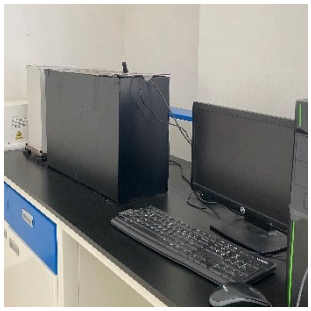
Gambar C.31 Pbi_2

Gambar C.32 Sablon

Gambar C. 33 *Scanning Electron Microscope* SEM

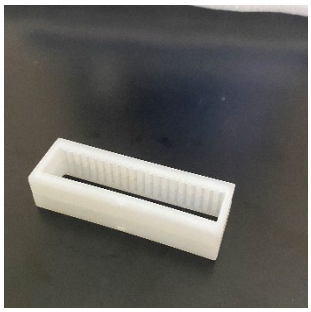


Gambar C.34 *Solar Simulator*



Gambar C.35 *Solar Test* I-V *System*

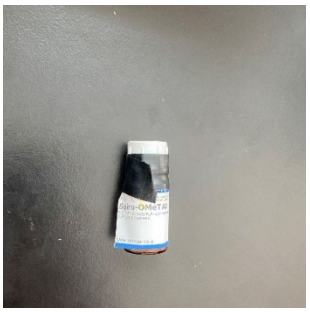
Gambar C. 36 Spatula



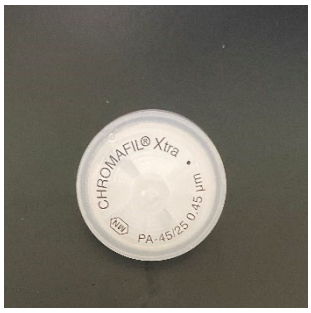
Gambar C.37 Substrat Rak

Gambar C.38 *Spin Bar*

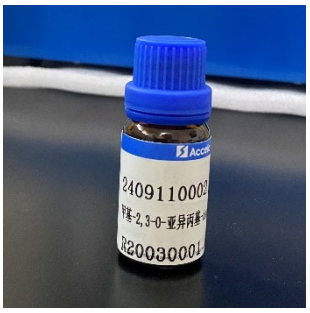
Gambar C.39 *Spin Coater*



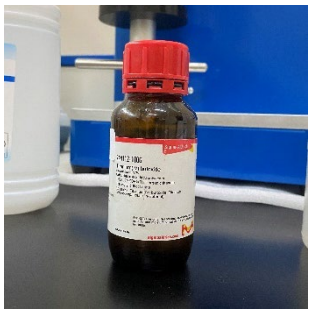
Gambar C.40 Spiro-Ometad



Gambar C.41 *Syringe Filter*



Gambar C.42 Tetrabutyl Pytidine



Gambar C.43 Tetrabutyl Titanate

Gambar C.44 *Ultrasonic Bath*

Gambar C.45 UV *Curing Lamp*

Gambar C. 46 UV-Vis Spektrofotometer