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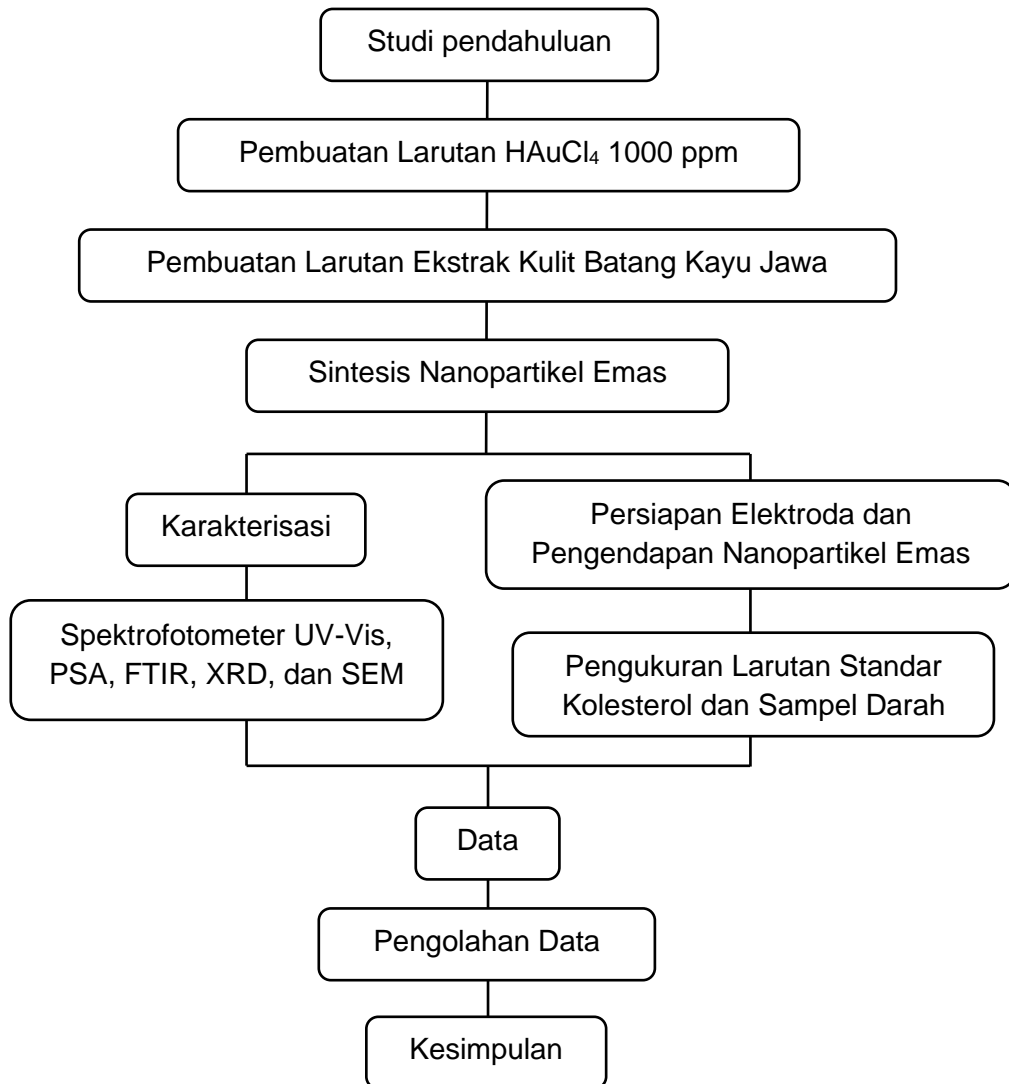
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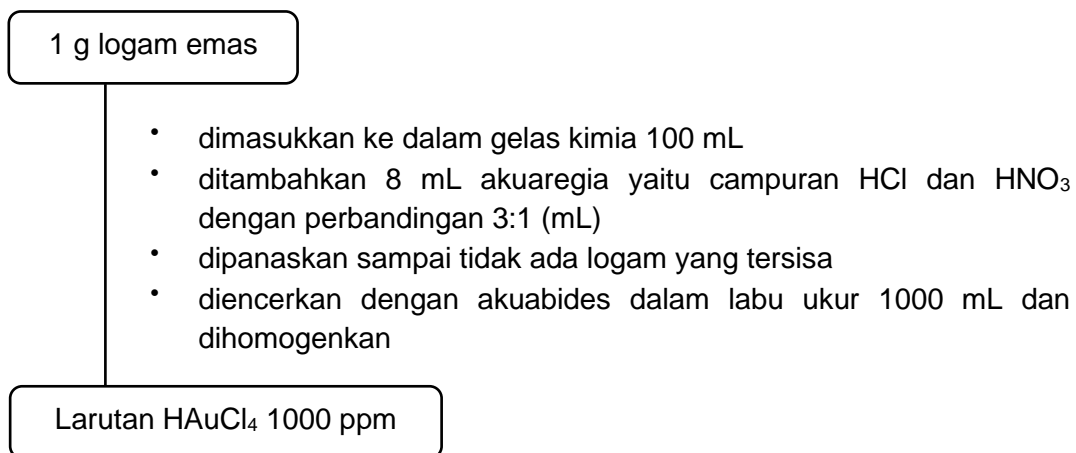
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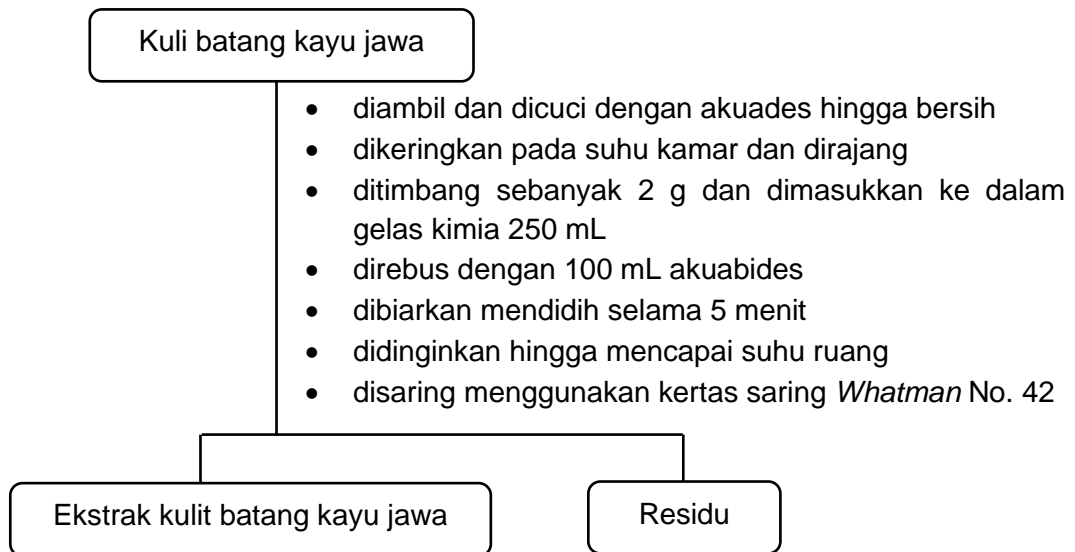
## LAMPIRAN

Lampiran 1. Diagram alir penelitian



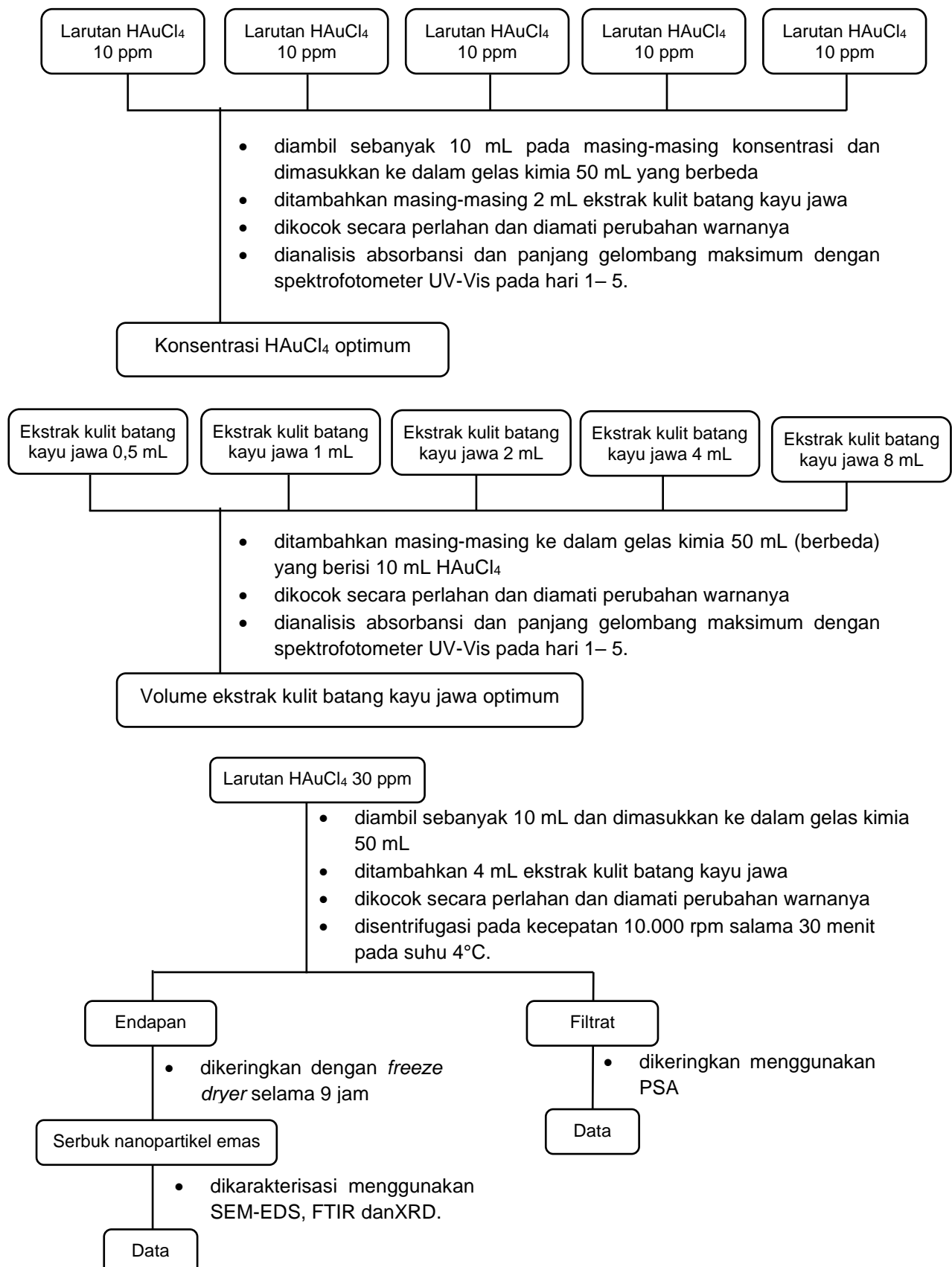
**Lampiran 2.** Bagan kerja pembuatan larutan H<sub>AuCl</sub><sub>4</sub> 1000 ppm

**Lampiran 3.** Bagan kerja pembuatan larutan ekstrak kulit batang kayu jawa

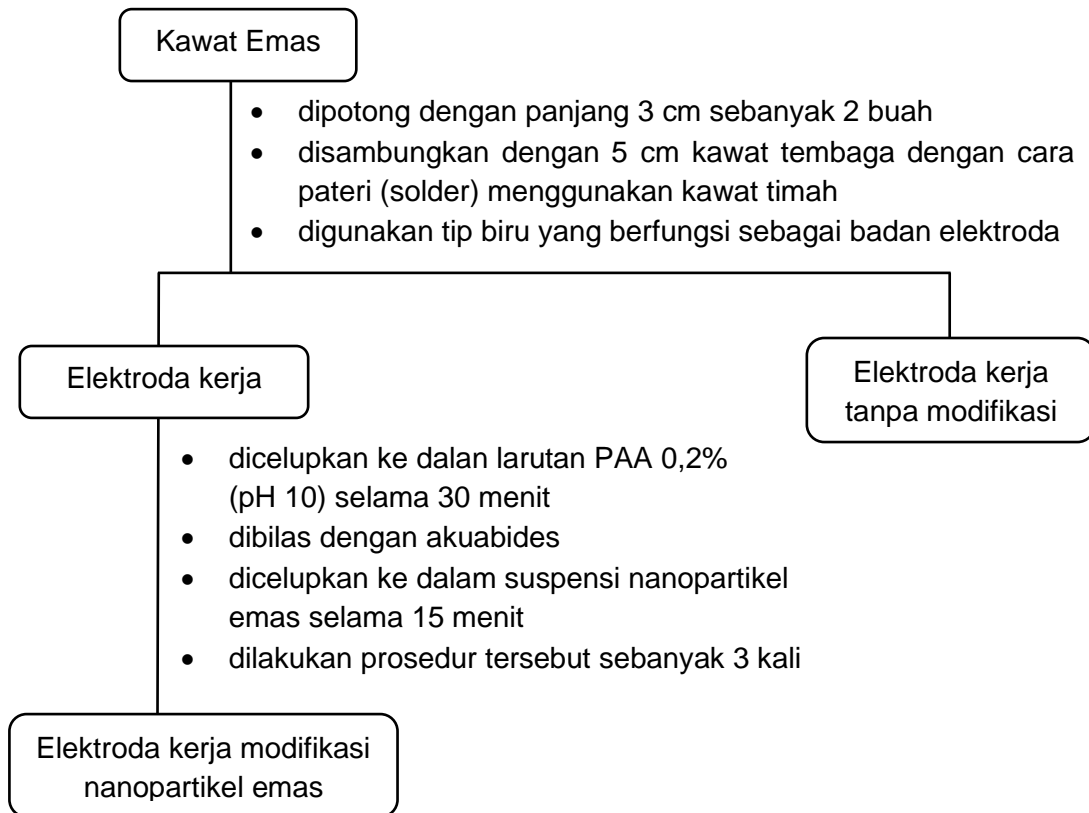


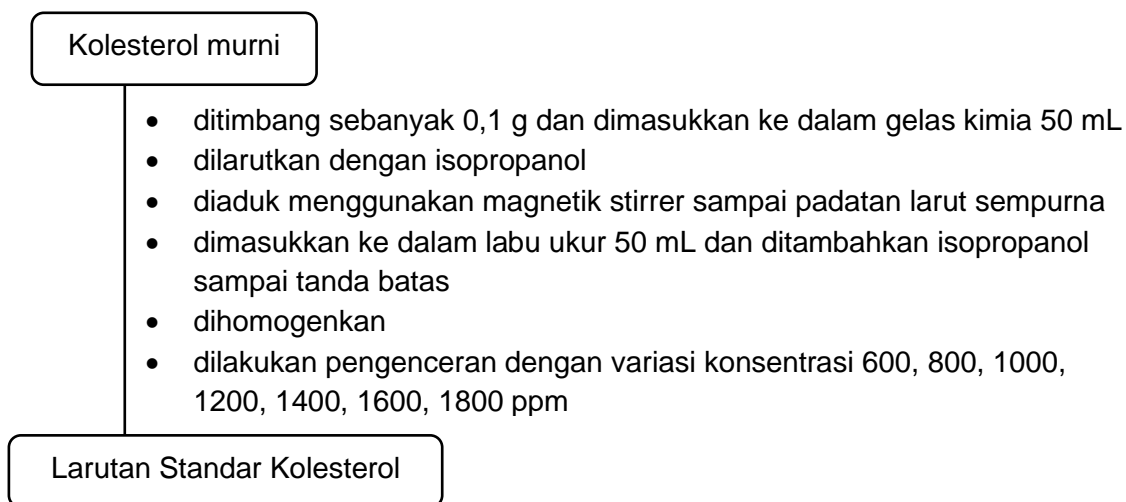


#### Lampiran 4. Bagan kerja sintesis dan karakterisasi nanopartikel emas

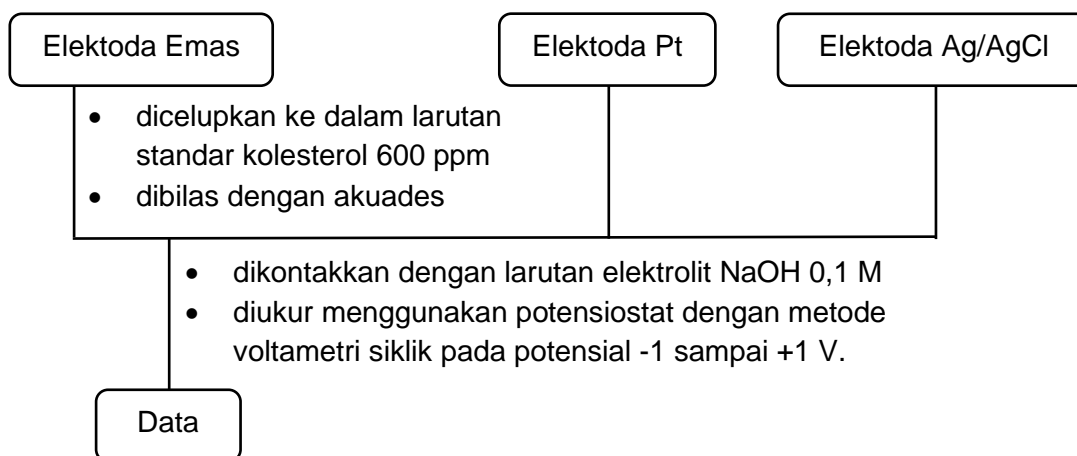


**Lampiran 5.** Bagan kerja desain elektroda dan pengendapan nanopartikel emas



**Lampiran 6.** Bagan kerja pembuatan larutan standar kolesterol

**Lampiran 7.** Bagan kerja pengukuran larutan standar kolesterol dan sampel darah



**Catatan:**

- dilakukan prosedur yang sama dengan mengganti larutan standar kolesterol 600 ppm menjadi 800, 1000, 1200, 1400, 1600, 1800, 2000 ppm
- elektroda kerja tanpa modifikasi diganti dengan elektroda kerja modifikasi nanopartikel emas
- dilakukan uji validasi dengan beberapa parameter yaitu linearitas, limit deteksi, dan sensitivitas.
- dilakukan prosedur yang sama untuk sampel darah.

### Lampiran 8. Dokumentasi penelitian



Logam emas 1 g



Proses peleburan logam emas dengan akuaregia



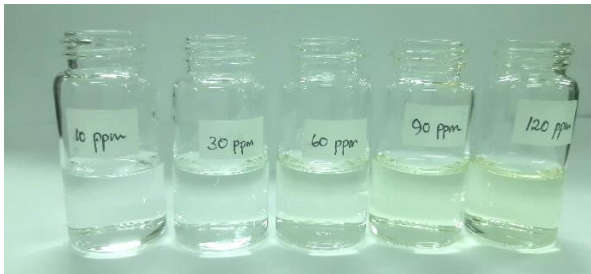
Larutan  $\text{HAuCl}_4$  1000 ppm



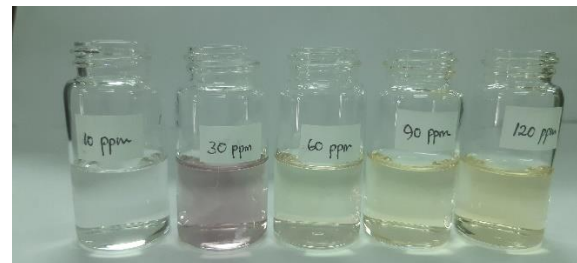
Kulit batang kayu jawa



Proses perebusan kulit batang kayu jawa



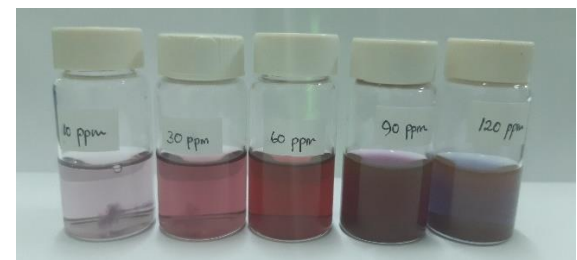
Variasi konsentrasi larutan  $\text{HAuCl}_4$  (sebelum sintesis)



Pembentukan nanopartikel emas pada menit ke-2 setelah sintesis



Pembentukan nanopartikel emas pada hari ke-3



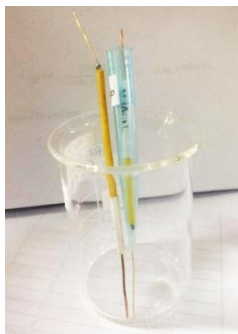
Pembentukan nanopartikel emas pada hari ke-5



Proses sentrifugasi



Serbuk nanopartikel emas



Desain elektroda kerja



Pengukuran pada potensiostat



XRD



SEM



Spektrofotometer UV-Vis



FTIR

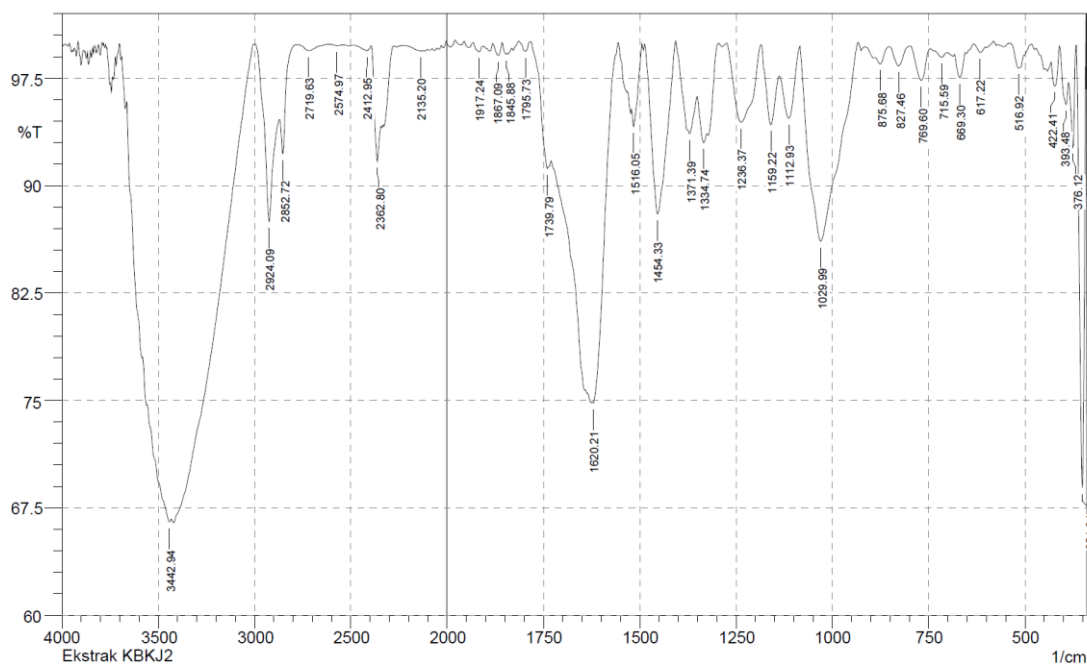
**Lampiran 9.** Hasil Analisis nanopartikel emas menggunakan spektrofotometer UV-Vis

Waktu (Hari)	Konsentrasi H <sub>AuCl</sub> <sub>4</sub> (ppm)									
	10		30		60		90		120	
	nm	Abs.	nm	Abs.	nm	Abs.	nm	Abs.	nm	Abs.
1	528,5	0,179	524,0	0,483	532,5	0,601	538,0	0,639	545,0	0,382
2	523,5	0,192	523,5	0,498	534,0	1,054	543,0	1,070	562,5	0,617
3	525,5	0,186	525,5	0,506	529,5	1,176	545,5	1,204	568,5	0,656
4	525,5	0,182	525,5	0,501	528,5	1,238	545,5	1,459	572,5	0,752
5	524,0	0,189	525,5	0,513	527,5	1,221	547,0	1,426	572,5	0,653

Waktu (Hari)	Volume Ekstrak Kulit Batang Kayu Jawa (mL)									
	0,5		1		2		4		8	
	nm	Abs.	nm	Abs.	nm	Abs.	nm	Abs.	nm	Abs.
1	526,0	0,592	531,5	0,610	531,0	0,612	529,5	0,531	529,0	0,401
2	524,0	0,639	531,0	0,624	530,0	0,629	529,5	0,541	531,0	0,405
3	523,5	0,635	530,0	0,625	531,0	0,633	529,5	0,545	530,0	0,409
4	523,5	0,644	530,5	0,625	532,0	0,634	529,5	0,549	531,0	0,412
5	523,0	0,648	528,5	0,628	531,0	0,644	530,5	0,554	530,0	0,418

## Lampiran 10. Hasil karakterisasi nanopartikel emas menggunakan FTIR

### a. Spektrum FTIR ekstrak kulit batang kayu jawa

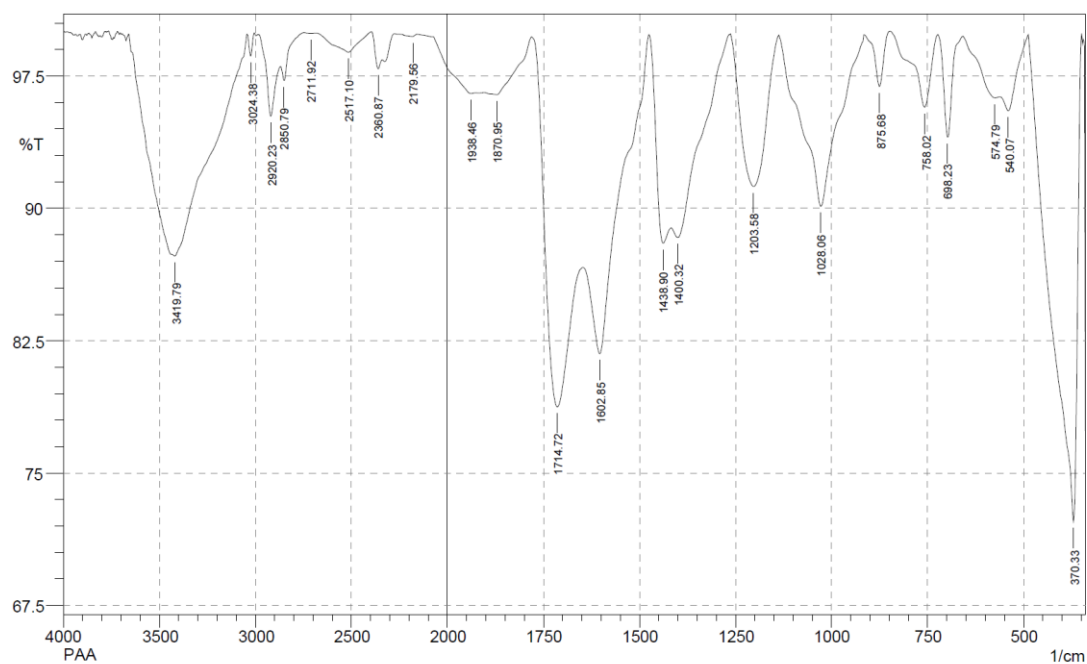


No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	351.04	68.898	28.54	366.48	343.33	2.078	1.861
2	376.12	92.68	5.93	387.69	366.48	0.382	0.241
3	393.48	95.665	2.158	410.84	387.69	0.294	0.138
4	422.41	96.955	2.188	432.05	410.84	0.211	0.136
5	516.92	98.209	0.18	540.07	514.99	0.094	-0.004
6	617.22	99.278	0.501	634.58	603.72	0.06	0.032
7	669.3	97.535	1.689	682.8	655.8	0.212	0.12
8	715.59	98.967	0.374	734.88	702.09	0.12	0.027
9	769.6	97.346	2.297	798.53	746.45	0.336	0.257
10	827.46	98.376	1.346	852.54	798.53	0.212	0.147
11	875.68	98.492	0.719	889.18	852.54	0.158	0.048
12	1029.99	86.109	13.713	1083.99	933.55	5.43	5.341
13	1112.93	94.702	3.914	1138	1083.99	0.805	0.495
14	1159.22	94.241	4.409	1184.29	1138	0.734	0.478
15	1236.37	94.419	5.471	1273.02	1186.22	1.354	1.308
16	1334.74	92.997	1.546	1352.1	1325.1	0.712	0.099
17	1371.39	93.631	3.964	1406.11	1352.1	1.023	0.564
18	1454.33	88.028	11.869	1487.12	1408.04	2.352	2.32
19	1516.05	94.131	2.191	1521.84	1494.83	0.445	0.161
20	1620.21	74.813	1.504	1624.06	1556.55	4.01	0.284
21	1739.79	91.182	2.082	1782.23	1730.15	1.131	0.182
22	1795.73	99.372	0.685	1813.09	1786.08	0.037	0.044
23	1845.88	99.173	0.167	1857.45	1843.95	0.034	0.011
24	1867.09	99.088	0.876	1882.52	1857.45	0.059	0.054
25	1917.24	99.327	0.506	1932.67	1905.67	0.05	0.032
26	2135.2	99.391	0.043	2150.63	2125.56	0.064	0.003
27	2362.8	91.705	4.604	2393.66	2343.51	1.2	0.497
28	2412.95	99.428	0.337	2492.03	2393.66	0.16	0.065
29	2574.97	99.772	0.028	2607.76	2565.33	0.035	0.002
30	2719.63	99.426	0.423	2777.5	2619.33	0.227	0.126
31	2852.72	92.23	3.521	2870.08	2791	1.087	0.279
32	2924.09	87.482	9.315	2997.38	2872.01	3.533	1.973
33	3442.94	66.516	0.576	3516.23	3435.22	13.501	0.292



## b. Spektrum FTIR nanopartikel emas

SHIMADZU



	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	370.33	72.265	27.293	487.99	351.04	9.975	9.781
2	540.07	95.532	1.81	561.29	487.99	0.873	0.252
3	574.79	96.26	0.546	657.73	561.29	0.973	0.14
4	698.23	94.039	5.773	723.31	657.73	0.657	0.601
5	758.02	95.732	4.15	846.75	725.23	0.996	0.959
6	875.68	96.912	3.044	914.26	848.68	0.348	0.33
7	1028.06	90.122	9.704	1138	916.19	4.674	4.506
8	1203.58	91.242	8.571	1263.37	1139.93	2.87	2.767
9	1400.32	88.345	1.654	1415.75	1265.3	4.157	0.348
10	1438.9	88.033	4.987	1473.62	1417.68	2.204	0.703
11	1602.85	81.764	8.295	1647.21	1475.54	8.205	2.866
12	1714.72	78.744	14.441	1780.3	1649.14	8.793	4.591
13	1870.95	96.449	0.957	1903.74	1782.23	1.367	0.376
14	1938.46	96.501	0.303	2071.55	1926.89	1.33	0.125
15	2179.56	99.728	0.144	2276	2160.27	0.094	0.035
16	2360.87	97.916	1.085	2397.52	2339.65	0.321	0.122
17	2517.1	98.843	1.135	2679.13	2397.52	0.757	0.723
18	2711.92	99.908	0.032	2746.63	2679.13	0.022	0.005
19	2850.79	97.249	1.089	2870.08	2746.63	0.533	-0.011
20	2920.23	95.22	3.638	2980.02	2870.08	1.243	0.723
21	3024.38	98.639	1.274	3043.67	3007.02	0.115	0.101
22	3419.79	87.301	12.561	3658.96	3043.67	19.877	19.513

Lampiran 11. Hasil karakterisasi nanopartikel emas menggunakan PSA



HORIBA SZ-100 for Windows [Z Type] Ver2.00

**SZ-100**

034.C.PSA.VIII.2022.nsz

**Measurement Results**

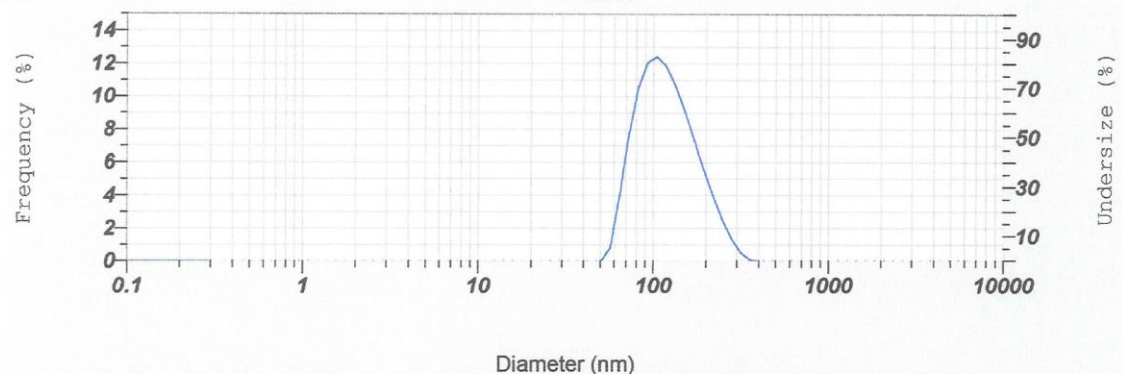
Date : Saturday, August 20, 2022 2:31:44 PM  
 Measurement Type : Particle Size  
 Sample Name : NPE  
 Scattering Angle : 90  
 Temperature of the Holder : 25.0 °C  
 Dispersion Medium Viscosity : 0.896 mPa·s  
 Transmission Intensity before Meas. : 28380  
 Distribution Form : Standard  
 Distribution Form(Dispersity) : Monodisperse  
 Representation of Result : Scattering Light Intensity  
 Count Rate : 268 kCPS

**Calculation Results**

Peak No.	S.P.Area Ratio	Mean	S. D.	Mode
1	1.00	119.2 nm	46.8 nm	98.7 nm
2	---	--- nm	--- nm	--- nm
3	---	--- nm	--- nm	--- nm
Total	1.00	119.2 nm	46.8 nm	98.7 nm

**Cumulant Operations**

Z-Average : 91.9 nm  
 PI : 0.515



No.	Diameter	Frequency	Cumulation	No.	Diameter	Frequency	Cumulation	No.	Diameter	Frequency	Cumulation	No.	Diameter	Frequency	Cumulation
1	0.34	0.000	0.000	22	4.40	0.000	0.000	43	57.09	0.802	0.802	64	740.89	0.000	100.000
2	0.38	0.000	0.000	23	4.97	0.000	0.000	44	64.50	4.003	4.805	65	837.07	0.000	100.000
3	0.43	0.000	0.000	24	5.61	0.000	0.000	45	72.87	7.734	12.539	66	945.74	0.000	100.000
4	0.49	0.000	0.000	25	6.34	0.000	0.000	46	82.33	10.548	23.088	67	1088.52	0.000	100.000
5	0.55	0.000	0.000	26	7.17	0.000	0.000	47	93.02	12.059	35.145	68	1207.24	0.000	100.000
6	0.62	0.000	0.000	27	8.10	0.000	0.000	48	105.10	12.378	47.523	69	1363.97	0.000	100.000
7	0.70	0.000	0.000	28	9.15	0.000	0.000	49	118.74	11.762	59.305	70	1541.04	0.000	100.000
8	0.80	0.000	0.000	29	10.34	0.000	0.000	50	134.16	10.569	69.874	71	1741.10	0.000	100.000
9	0.90	0.000	0.000	30	11.68	0.000	0.000	51	151.57	8.999	78.873	72	1967.14	0.000	100.000
10	1.02	0.000	0.000	31	13.20	0.000	0.000	52	171.25	7.277	86.151	73	2222.51	0.000	100.000
11	1.15	0.000	0.000	32	14.91	0.000	0.000	53	193.48	5.557	91.708	74	2511.05	0.000	100.000
12	1.30	0.000	0.000	33	16.84	0.000	0.000	54	218.60	3.945	95.652	75	2837.04	0.000	100.000
13	1.47	0.000	0.000	34	19.03	0.000	0.000	55	248.98	2.515	98.168	76	3205.35	0.000	100.000
14	1.66	0.000	0.000	35	21.50	0.000	0.000	56	279.04	1.330	99.498	77	3621.48	0.000	100.000
15	1.87	0.000	0.000	36	24.29	0.000	0.000	57	315.27	0.467	99.965	78	4091.63	0.000	100.000
16	2.11	0.000	0.000	37	27.45	0.000	0.000	58	356.20	0.035	100.000	79	4622.81	0.000	100.000
17	2.39	0.000	0.000	38	31.01	0.000	0.000	59	402.44	0.000	100.000	80	5222.96	0.000	100.000
18	2.70	0.000	0.000	39	35.03	0.000	0.000	60	454.69	0.000	100.000	81	5901.02	0.000	100.000
19	3.05	0.000	0.000	40	39.58	0.000	0.000	61	513.71	0.000	100.000	82	6667.10	0.000	100.000
20	3.45	0.000	0.000	41	44.72	0.000	0.000	62	580.41	0.000	100.000	83	7532.65	0.000	100.000
21	3.89	0.000	0.000	42	50.53	0.000	0.000	63	655.76	0.000	100.000	84	8510.58	0.000	100.000

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## Lampiran 12. Hasil karakterisasi nanopartikel emas menggunakan XRD

```

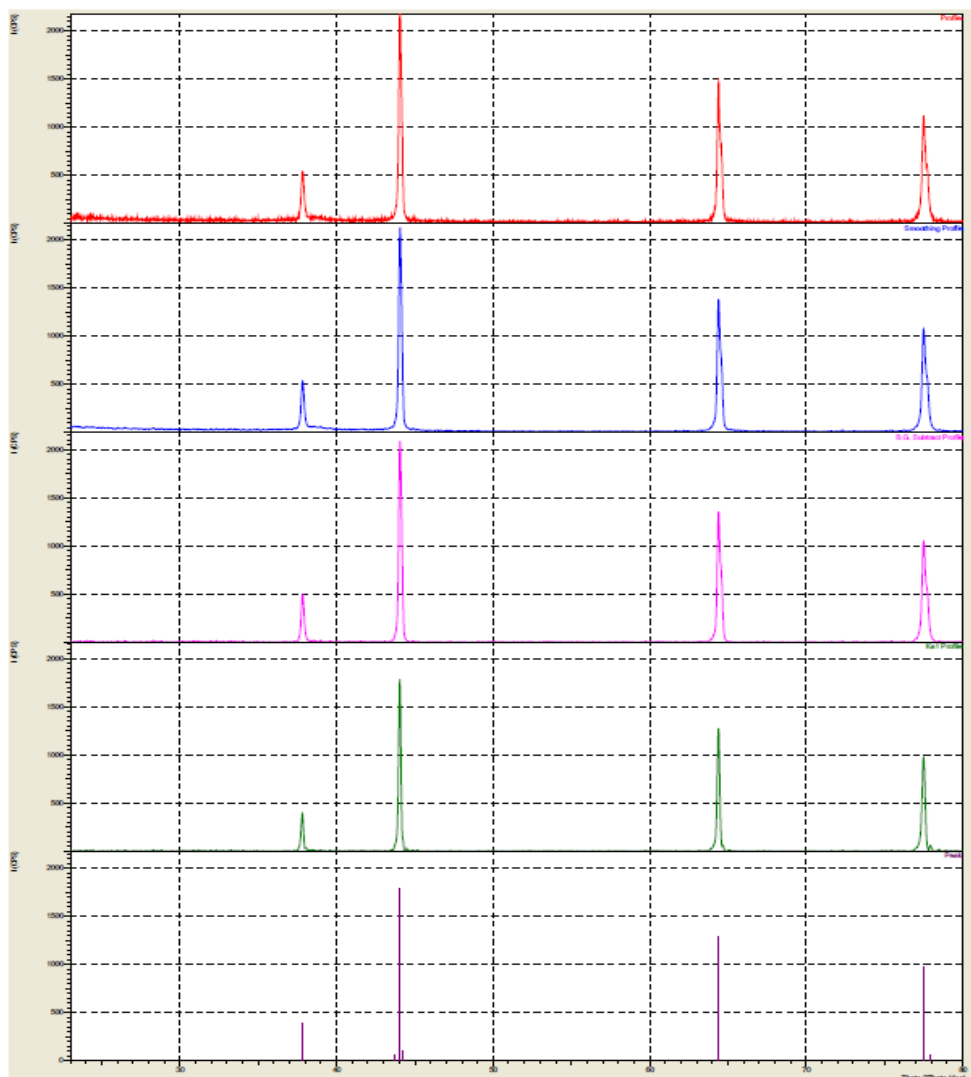
*** Basic Data Process ***

Group   : Standard
Data    : TrianaPPA01

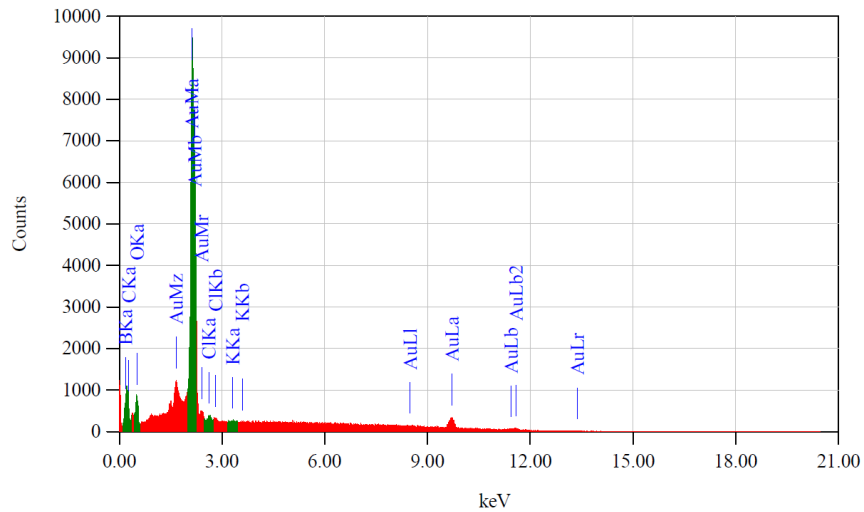
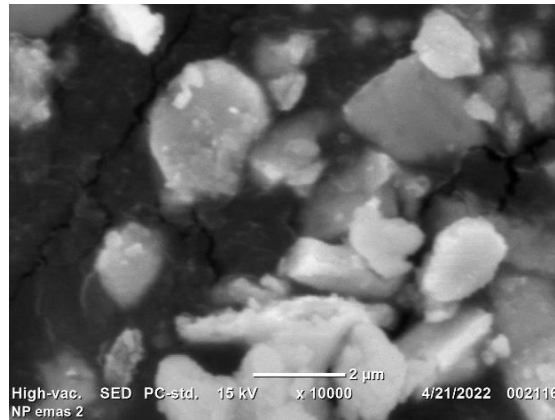
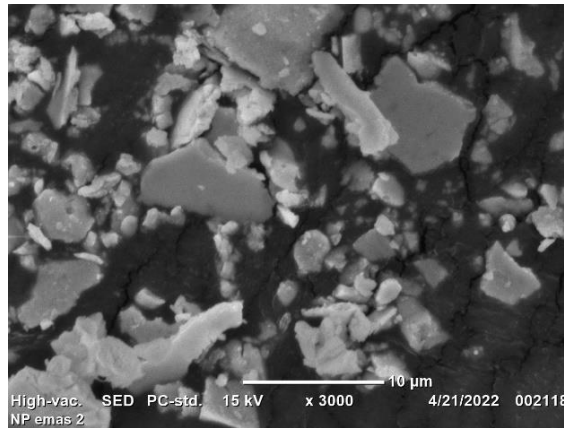
# Strongest 3 peaks
no. peak  2Theta      d      I/I1  FWHM  Intensity  Integrated Int
   no.    (deg)      (A)    (deg) (Counts)  (Counts)
  1     3     44.0362    2.05468  100  0.16470   1073     9612
  2     5     64.3965    1.44562   71  0.18260    767     8259
  3     6     77.4992    1.23067   54  0.22730    584     7671

# Peak Data List
peak      2Theta      d      I/I1  FWHM  Intensity  Integrated Int
  no.     (deg)      (A)    (deg) (Counts)  (Counts)
   1     37.8101    2.37746   22  0.17430    234     2422
   2     43.7200    2.06881    3  0.11000     37     466
   3     44.0362    2.05468  100  0.16470   1073     9612
   4     44.2600    2.04481    6  0.06380     60     520
   5     64.3965    1.44562   71  0.18260    767     8259
   6     77.4992    1.23067   54  0.22730    584     7671
   7     77.9366    1.22486    3  0.16670     37     364

```



Lampiran 13. Hasil karakterisasi nanopartikel emas menggunakan SEM



Acquisition Parameter  
 Instrument : JCM-6000PI  
 Acc. Voltage : 15.0 kV  
 Probe Current: 1.00000 nA  
 PHA mode : T3  
 Real Time : 52.76 sec  
 Live Time : 50.00 sec  
 Dead Time : 5 %  
 Counting Rate: 8756 cps  
 Energy Range : 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis  
 Fitting Coefficient : 0.1141

Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
B K	0.183	5.63	1084.27	0.04	45.88				4.6332
C K	0.277	0.64	719.53	0.02	4.67				0.7893
O K	0.525	1.23	3595.77	0.02	6.78				0.3054
Cl K	2.621	0.52	1377.23	0.03	1.30				0.3386
K K	3.312	0.12	268.60	0.02	0.27				0.3932
Au M (Ref.)	2.120	91.86	81996.10	0.42	41.11				1.0000
Total		100.00			100.00				

**Lampiran 14.** Perhitungan ukuran nanopartikel emas berdasarkan hasil karakterisasi XRD

$$D = \frac{K \lambda}{\beta \cos \theta}$$

Keterangan : D = ukuran kristal (nm)

K = konstanta *Scherrer* (0,94)

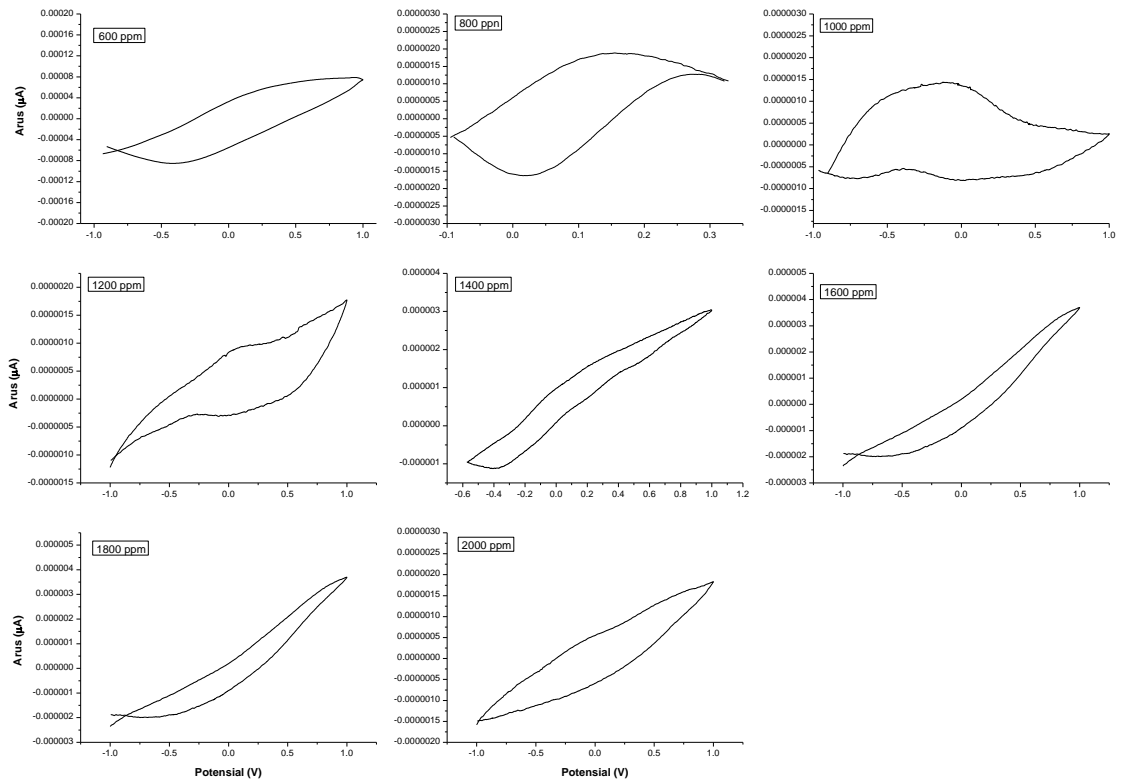
$\lambda$  = Panjang gelombang sinar-X, Cu-K $\alpha$  (0,15405 nm)

$\beta$  = nilai FWHM (radian)

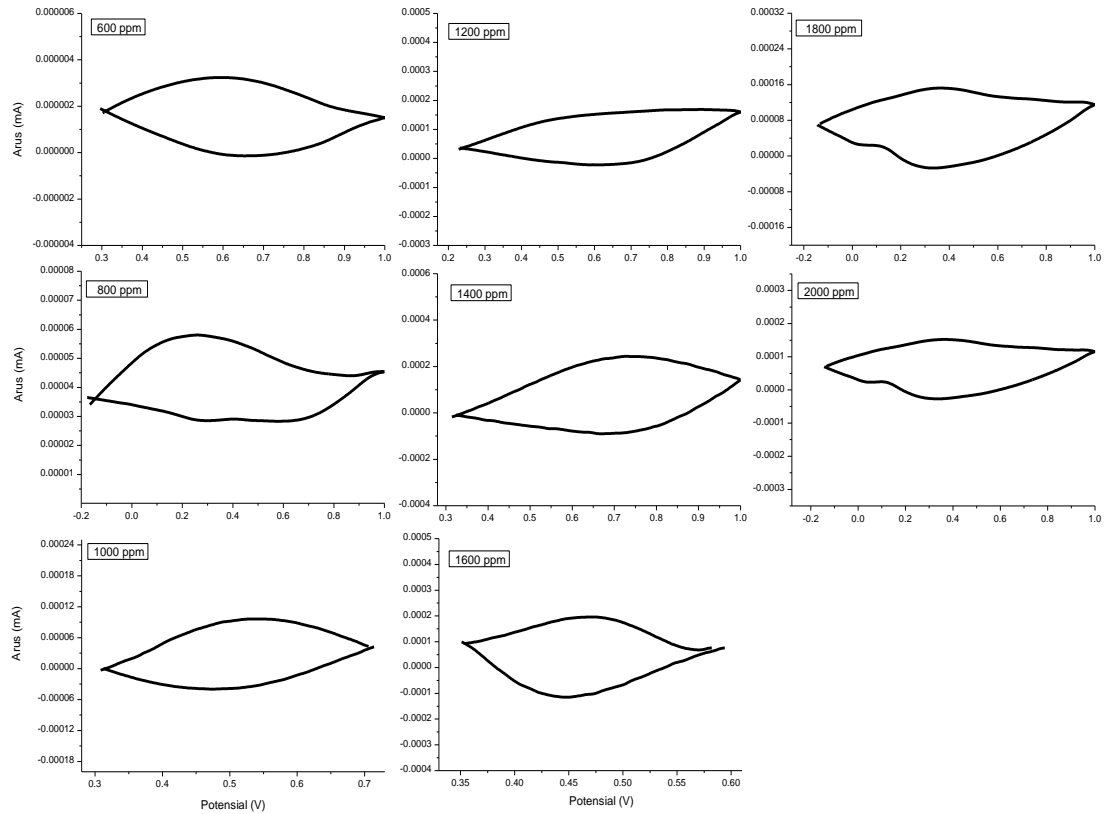
$\theta$  = setengah sudut *Bragg* (°)

No.	2 $\theta$ (derajat)	FWHM (derajat)	Indeks Miller	Ukuran (nm)
1	37,8101	0,1743	111	48,1770
2	44,0362	0,1647	200	52,0296
3	64,3965	0,1826	202	51,4134
4	77,4992	0,2273	311	44,8149
<b>Rata-rata ukuran kristal</b>				49,1087

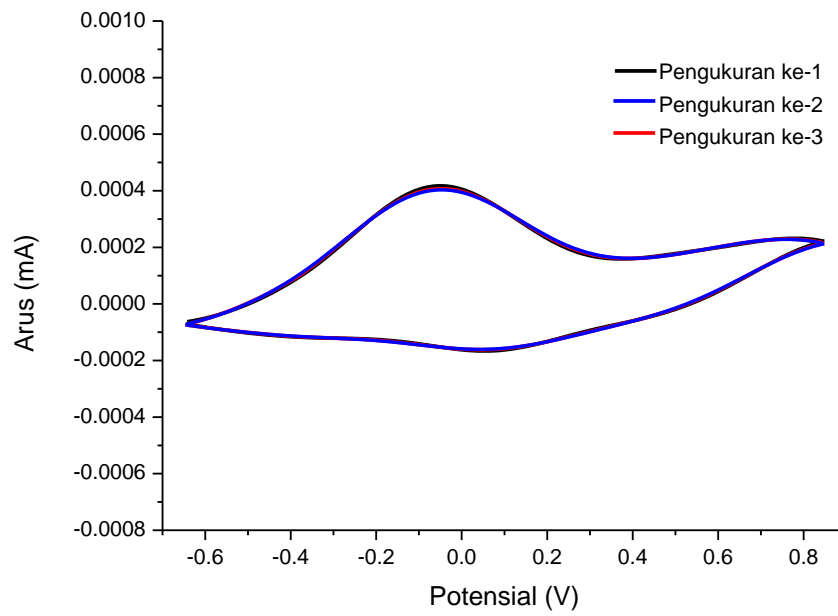
**Lampiran 15.** Voltamogram hasil pengukuran larutan kolesterol standar menggunakan elektroda tanpa modifikasi nanopartikel pada alat potensiostat dengan metode voltametri siklik



**Lampiran 16.** Voltamogram hasil pengukuran larutan kolesterol standar menggunakan elektroda modifikasi nanopartikel pada alat potensiostat dengan metode voltametri siklik



**Lampiran 17.** Voltamogram hasil pengukuran larutan kolesterol darah menggunakan elektroda modifikasi nanopartikel pada alat potensiostat dengan metode voltametri siklik





**Lampiran 18.** Perhitungan konsentrasi kolesterol dalam sampel darah

Persamaan regresi linier :  $y = 0,0003x - 0,1811$

*Slope* = 0,0003

*Intercept* = 0,1811

Konsentrasi kolesterol:

Pengukuran 1 (0,399 mA),  $y = 0,0003x - 0,1811$

$$0,399 = 0,0003x - 0,1811$$

$$x = 1933,66 \text{ ppm}$$

$$x = 193,36$$

Pengukuran 2 (0,395 mA),  $y = 0,0003x - 0,1811$

$$0,395 = 0,0003x - 0,1811$$

$$x = 1920,33 \text{ ppm}$$

$$x = 192,03$$

Pengukuran 3 (0,398 mA),  $y = 0,0003x - 0,1811$

$$0,399 = 0,0003x - 0,1811$$

$$x = 1930,33 \text{ ppm}$$

$$x = 193,03$$

Pengukuran ke-	Arus (mA) dari elektroda modifikasi nanopartikel emas	Konsentrasi kolesterol	
		(ppm)	(mg/dL)
1	0.399	1933,66	193,36
2	0,395	1920,33	192,03
3	0,398	1930,33	193,03
<b>Rata-Rata</b>	0.399	1928,10	192,80