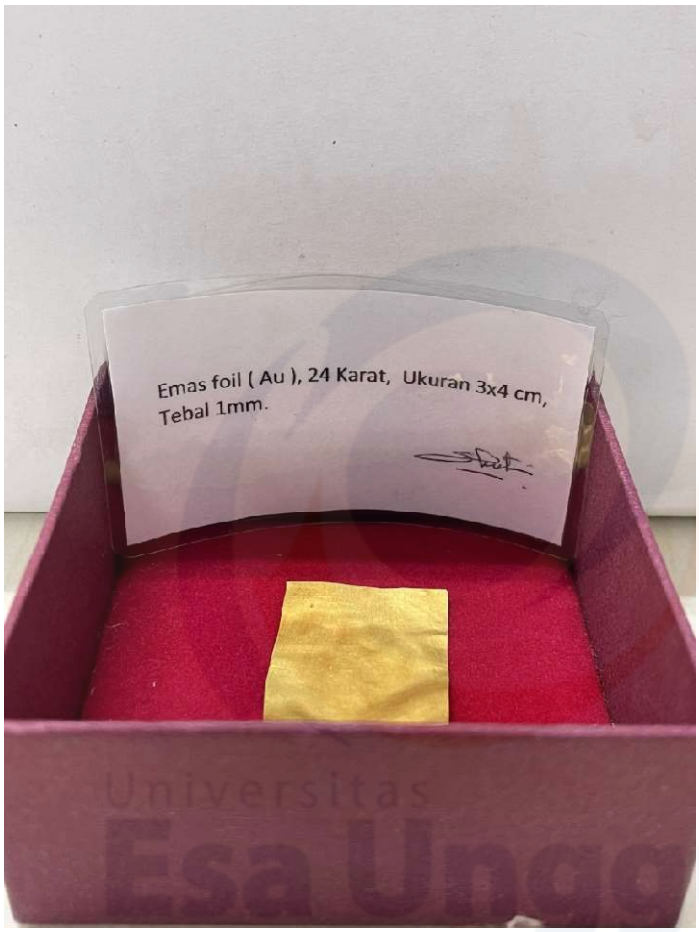
LAMPIRAN

Lampiran 1. Au *Foil*



Lampiran 2. Sertifikat Analisis Kuersetin

Sigma-Aldrich.

3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Name:
Quercetin – ≥95% (HPLC), solid

Product Number:	**Q4951**
Batch Number:	**SLCJ0103**
Brand:	SIGMA
CAS Number:	117-39-5
Formula:	C15H10O7
Formula Weight:	302.24 g/mol
Quality Release Date:	10 DEC 2020

Test	Specification	Result
Appearance (Color)	Conforms	Conforms
Yellow		
Appearance (Form)	Powder	Powder
1H NMR Spectrum	Conforms to Structure	Conforms
Loss on Drying	≤ 4 %	3 %
Purity (HPLC)	≥ 95 %	97 %

Brian Dulle, Supervisor
Quality Assurance
St. Louis, Missouri US

Version Number: 1

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Lampiran 3. Sertifikat Analisis Asam Askorbat

Certificate of Analysis

1.00468.0000 L(+)-Ascorbic Acid for analysis EMSURE® ACS,Reag. Ph Eur
Batch K54197668

	Spec. Values		Batch Values	
Assay (iodometric)	99.0 - 100.5	%	99.7	%
Identity (IR-spectrum)	conforms		conforms	
Appearance	white or almost white, cristalline powder		white or almost white, cristalline powder	
Appearance of solution (50 g/l CO_2-free water)	clear (≤ 3 NTU) and not so intense in colour than reference solution BY_7		clear (≤ 3 NTU) and not so intense in colour than reference solution BY_7	
pH (50 g/l CO_2-free water)	2.1 - 2.6		2.4	
Spec. rotation [α]20/D (100 g/l, water)	+20.5 - +21.5	°	+20.8	°
Chloride (Cl)	≤ 50	ppm	≤ 50	ppm
Sulfate (SO_4)	≤ 20	ppm	≤ 20	ppm
Cu (Copper)	≤ 5	ppm	≤ 5	ppm
Fe (Iron)	≤ 2	ppm	≤ 2	ppm
Heavy metals (ACS)	≤ 10	ppm	≤ 10	ppm
Oxalic acid	≤ 0.2	%	≤ 0.2	%
Related substances (HPLC) (Impurity C)	≤ 0.15	%	0.01	%
Related substances (HPLC) (Impurity D)	≤ 0.15	%	< 0.05	%
Related substances (HPLC) (unspecified impurities singly)	≤ 0.10	%	0.06	%
Related substances (HPLC) (sum of impurities (except impurity C and D))	≤ 0.2	%	< 0.1	%
Sulfated ash (600 °C)	≤ 0.05	%	≤ 0.05	%
Loss on Drying (105 °C)	≤ 0.1	%	< 0.1	%

Date of release (DD.MM.YYYY) 17.03.2022
Minimum shelf life (DD.MM.YYYY) 31.03.2024

Dr. Sebastian Lips
Responsible laboratory manager quality control

This document has been produced electronically and is valid without a signature.

Merck KGaA, Frankfurter Straße 250, 64293 Darmstadt (Germany): +49 6151 72-0
EMD Millipore Corporation - a subsidiary of Merck KGaA, Darmstadt, Germany
400 Summit Drive, Burlington, MA 01803, USA, Phone +1 (781) 533-6000
SALSA Version 1179899/960000922577// Date: 17.03.2022

Lampiran 4. Hasil Karakterisasi F4 dengan PSA

HORIBA Scientific

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

SZ-100

034.C.PSA.VI.2022.nsz

Measurement Results

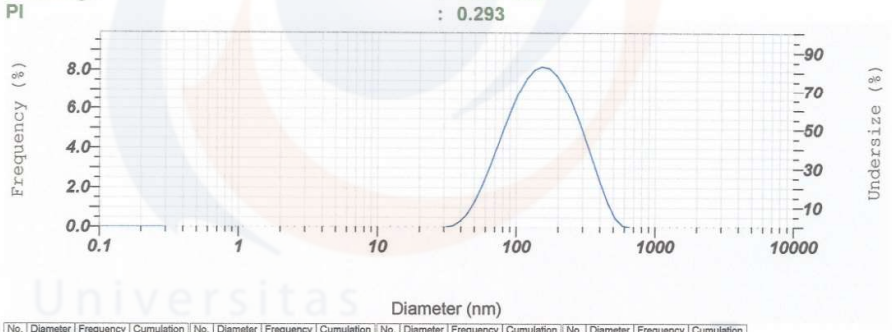
Date	: Friday, June 17, 2022 11:19:26 AM
Measurement Type	: Particle Size
Sample Name	: AuNPs Kuersetin
Scattering Angle	: 90
Temperature of the Holder	: 25.0 °C
Dispersion Medium Viscosity	: 0.896 mPa·s
Transmission Intensity before Meas.	: 21784
Distribution Form	: Standard
Distribution Form(Dispersity)	: Monodisperse
Representation of Result	: Scattering Light Intensity
Count Rate	: 3259 kCPS

Calculation Results

Peak No.	S.P.Area Ratio	Mean	S. D.	Mode
1	1.00	164.6 nm	88.4 nm	142.7 nm
2	---	--- nm	--- nm	--- nm
3	---	--- nm	--- nm	--- nm
Total	1.00	164.6 nm	88.4 nm	142.7 nm

Cumulant Operations

Z-Average	: 116.7 nm
PI	: 0.293



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	2.108	4.496	64	740.89	0.000	100.000
2	0.38	0.000	0.000	23	4.97	0.000	0.000	44	64.50	3.035	7.532	65	837.07	0.000	100.000
3	0.43	0.000	0.000	24	5.61	0.000	0.000	45	72.87	4.048	11.579	66	945.74	0.000	100.000
4	0.49	0.000	0.000	25	6.34	0.000	0.000	46	82.33	5.079	16.659	67	1068.52	0.000	100.000
5	0.55	0.000	0.000	26	7.17	0.000	0.000	47	93.02	6.056	22.717	68	1207.24	0.000	100.000
6	0.62	0.000	0.000	27	8.10	0.000	0.000	48	105.10	6.913	29.630	69	1363.97	0.000	100.000
7	0.70	0.000	0.000	28	9.15	0.000	0.000	49	118.74	7.584	37.214	70	1541.04	0.000	100.000
8	0.80	0.000	0.000	29	10.34	0.000	0.000	50	134.16	8.022	45.236	71	1741.10	0.000	100.000
9	0.90	0.000	0.000	30	11.68	0.000	0.000	51	151.57	8.201	53.437	72	1967.14	0.000	100.000
10	1.02	0.000	0.000	31	13.20	0.000	0.000	52	171.25	8.111	61.548	73	2222.51	0.000	100.000
11	1.15	0.000	0.000	32	14.91	0.000	0.000	53	193.48	7.760	69.308	74	2511.05	0.000	100.000
12	1.30	0.000	0.000	33	16.84	0.000	0.000	54	218.60	7.174	76.482	75	2837.04	0.000	100.000
13	1.47	0.000	0.000	34	19.03	0.000	0.000	55	246.98	6.390	82.872	76	3205.35	0.000	100.000
14	1.66	0.000	0.000	35	21.50	0.000	0.000	56	279.04	5.451	88.323	77	3621.48	0.000	100.000
15	1.87	0.000	0.000	36	24.29	0.000	0.000	57	315.27	4.407	92.730	78	4091.63	0.000	100.000
16	2.11	0.000	0.000	37	27.45	0.000	0.000	58	356.20	3.312	96.042	79	4622.81	0.000	100.000
17	2.39	0.000	0.000	38	31.01	0.000	0.000	59	402.44	2.227	98.269	80	5222.96	0.000	100.000
18	2.70	0.000	0.000	39	35.03	0.066	0.066	60	454.69	1.230	99.499	81	5901.02	0.000	100.000
19	3.05	0.000	0.000	40	39.58	0.292	0.358	61	513.71	0.445	99.943	82	6667.10	0.000	100.000
20	3.45	0.000	0.000	41	44.72	0.710	1.067	62	580.41	0.057	100.000	83	7532.85	0.000	100.000
21	3.89	0.000	0.000	42	50.53	1.321	2.388	63	655.76	0.000	100.000	84	8510.56	0.000	100.000

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HORIBA Scientific

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

SZ-100

Measurement Results

Zeta 034.C.PSA.VI.2022.nzt

Measurement Results

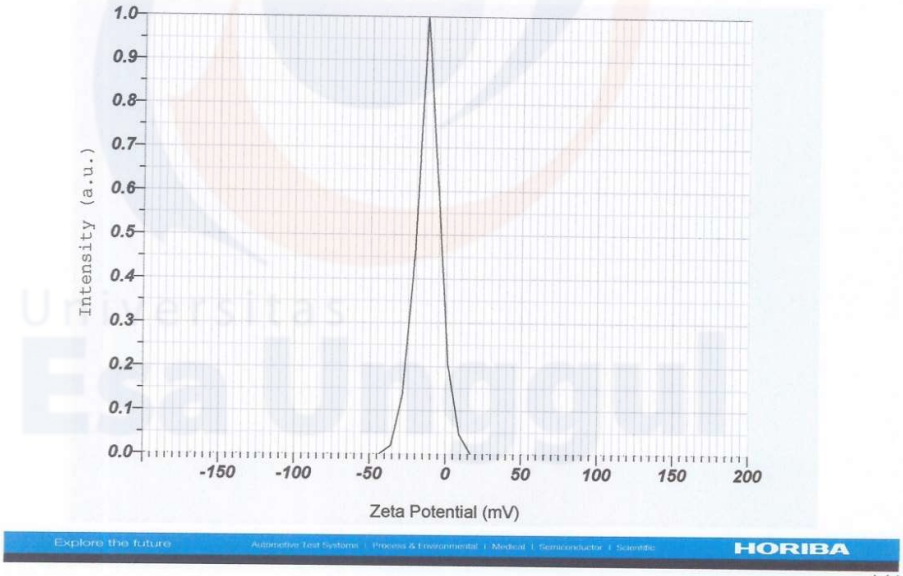
Date	: Tuesday, June 21, 2022 8:28:56 AM
Measurement Type	: Zeta Potential
Sample Name	: AuNPs Kuersetin
Temperature of the Holder	: 24.8 °C
Dispersion Medium Viscosity	: 0.899 mPa·s
Conductivity	: 0.316 mS/cm
Electrode Voltage	: 3.3 V

Calculation Results

Peak No.	Zeta Potential	Electrophoretic Mobility
1	-12.2 mV	-0.000094 cm2/Vs
2	--- mV	--- cm2/Vs
3	--- mV	--- cm2/Vs

Zeta Potential (Mean) : -12.2 mV

Electrophoretic Mobility Mean : -0.000094 cm^2/Vs



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Lampiran 5. Hasil Karakterisasi F5 dengan PSA

HORIBA Scientific

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

SZ-100

036.C.PSA.VI.2022.nsz

Measurement Results

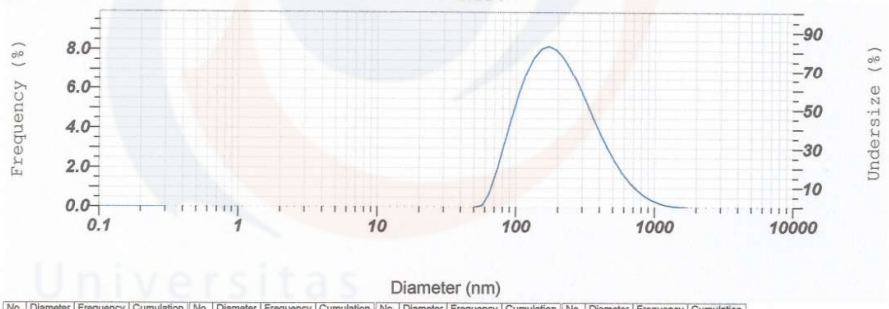
Date	: Friday, June 17, 2022 12:56:29 PM
Measurement Type	: Particle Size
Sample Name	: AuNPs Kuersetin (4)
Scattering Angle	: 90
Temperature of the Holder	: 24.8 °C
Dispersion Medium Viscosity	: 0.898 mPa·s
Transmission Intensity before Meas.	: 27327
Distribution Form	: Standard
Distribution Form(Dispersity)	: Monodisperse
Representation of Result	: Scattering Light Intensity
Count Rate	: 1858 kCPS

Calculation Results

Peak No.	S.P.Area Ratio	Mean	S. D.	Mode
1	1.00	223.7 nm	149.1 nm	161.1 nm
2	---	--- nm	--- nm	--- nm
3	---	--- nm	--- nm	--- nm
Total	1.00	223.7 nm	149.1 nm	161.1 nm

Cumulant Operations

Z-Average	: 179.1 nm
PI	: 0.384



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	0.068	0.068	64	740.89	0.883	98.698
2	0.38	0.000	0.000	23	4.97	0.000	0.000	44	64.50	0.700	0.768	65	837.07	0.585	99.283
3	0.43	0.000	0.000	24	5.61	0.000	0.000	45	72.87	1.829	2.596	66	945.74	0.363	99.647
4	0.49	0.000	0.000	25	6.34	0.000	0.000	46	82.33	3.177	5.773	67	1068.52	0.206	99.853
5	0.55	0.000	0.000	26	7.17	0.000	0.000	47	93.02	4.547	10.320	68	1207.24	0.101	99.954
6	0.62	0.000	0.000	27	8.10	0.000	0.000	48	105.10	5.802	16.122	69	1363.97	0.038	99.992
7	0.70	0.000	0.000	28	9.15	0.000	0.000	49	118.74	6.843	22.965	70	1541.04	0.008	100.000
8	0.80	0.000	0.000	29	10.34	0.000	0.000	50	134.16	7.606	30.571	71	1741.10	0.000	100.000
9	0.90	0.000	0.000	30	11.68	0.000	0.000	51	151.57	8.057	38.629	72	1967.14	0.000	100.000
10	1.02	0.000	0.000	31	13.20	0.000	0.000	52	171.25	8.191	46.820	73	2222.51	0.000	100.000
11	1.15	0.000	0.000	32	14.91	0.000	0.000	53	193.48	8.029	54.849	74	2511.05	0.000	100.000
12	1.30	0.000	0.000	33	16.84	0.000	0.000	54	218.60	7.613	62.462	75	2837.04	0.000	100.000
13	1.47	0.000	0.000	34	19.03	0.000	0.000	55	246.98	6.999	69.460	76	3205.35	0.000	100.000
14	1.66	0.000	0.000	35	21.50	0.000	0.000	56	279.04	6.248	75.708	77	3621.48	0.000	100.000
15	1.87	0.000	0.000	36	24.29	0.000	0.000	57	315.27	5.423	81.131	78	4091.63	0.000	100.000
16	2.11	0.000	0.000	37	27.45	0.000	0.000	58	356.20	4.578	85.709	79	4622.81	0.000	100.000
17	2.39	0.000	0.000	38	31.01	0.000	0.000	59	402.44	3.760	89.469	80	5222.96	0.000	100.000
18	2.70	0.000	0.000	39	35.03	0.000	0.000	60	454.69	3.002	92.471	81	5901.02	0.000	100.000
19	3.05	0.000	0.000	40	39.58	0.000	0.000	61	513.71	2.328	94.798	82	6667.10	0.000	100.000
20	3.45	0.000	0.000	41	44.72	0.000	0.000	62	580.41	1.749	96.547	83	7532.65	0.000	100.000
21	3.89	0.000	0.000	42	50.53	0.000	0.000	63	655.76	1.268	97.815	84	8510.56	0.000	100.000

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HORIBA Scientific

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

SZ-100

Measurement Results

Zeta 036.C.PSA.VI.2022.nzt

Measurement Results

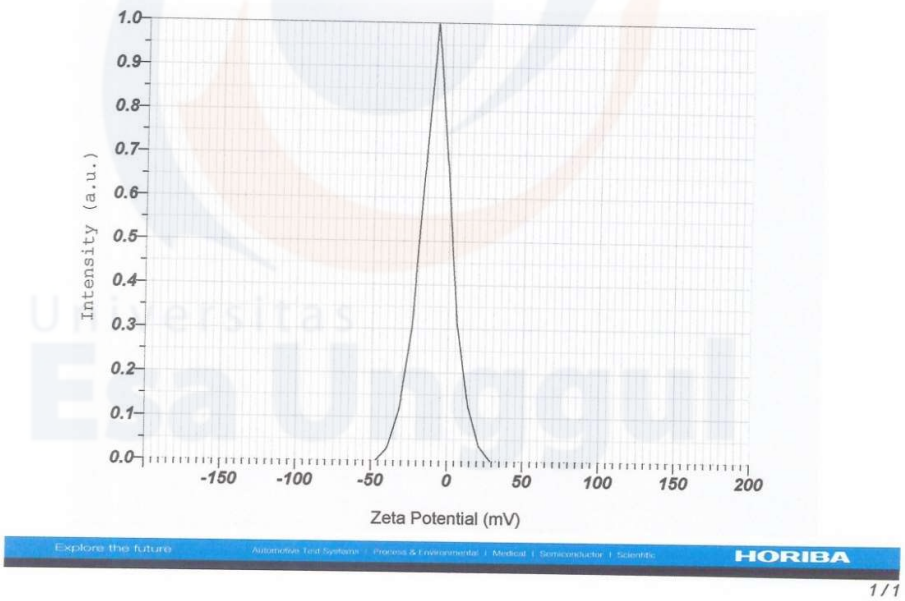
Date	: Tuesday, June 21, 2022 8:36:37 AM
Measurement Type	: Zeta Potential
Sample Name	: AuNPs Kuersetin (4)
Temperature of the Holder	: 24.8 °C
Dispersion Medium Viscosity	: 0.900 mPa·s
Conductivity	: 0.535 mS/cm
Electrode Voltage	: 3.3 V

Calculation Results

Peak No.	Zeta Potential	Electrophoretic Mobility
1	-8.8 mV	-0.000068 cm2/Vs
2	--- mV	--- cm2/Vs
3	--- mV	--- cm2/Vs

Zeta Potential (Mean) : -8.8 mV

Electrophoretic Mobility Mean : -0.000068 cm^2/Vs



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Lampiran 6. Alat Penelitian

Neraca Analitik

Magnetic Stirrer

Spektrofotometer UV-Vis

Lampiran 7. Bahan Penelitian

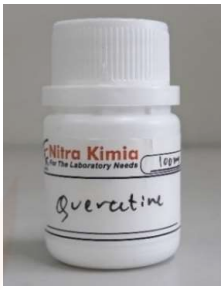
Au foil

HCl pekat

HNO_3 pekat

Aqua Pro Injection

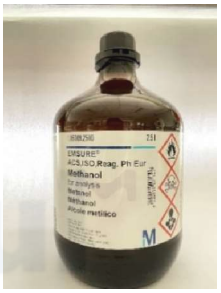
HCl 0,01 M



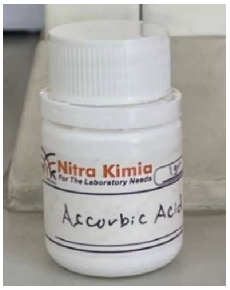
Kuersetin

DMSO

DPPH

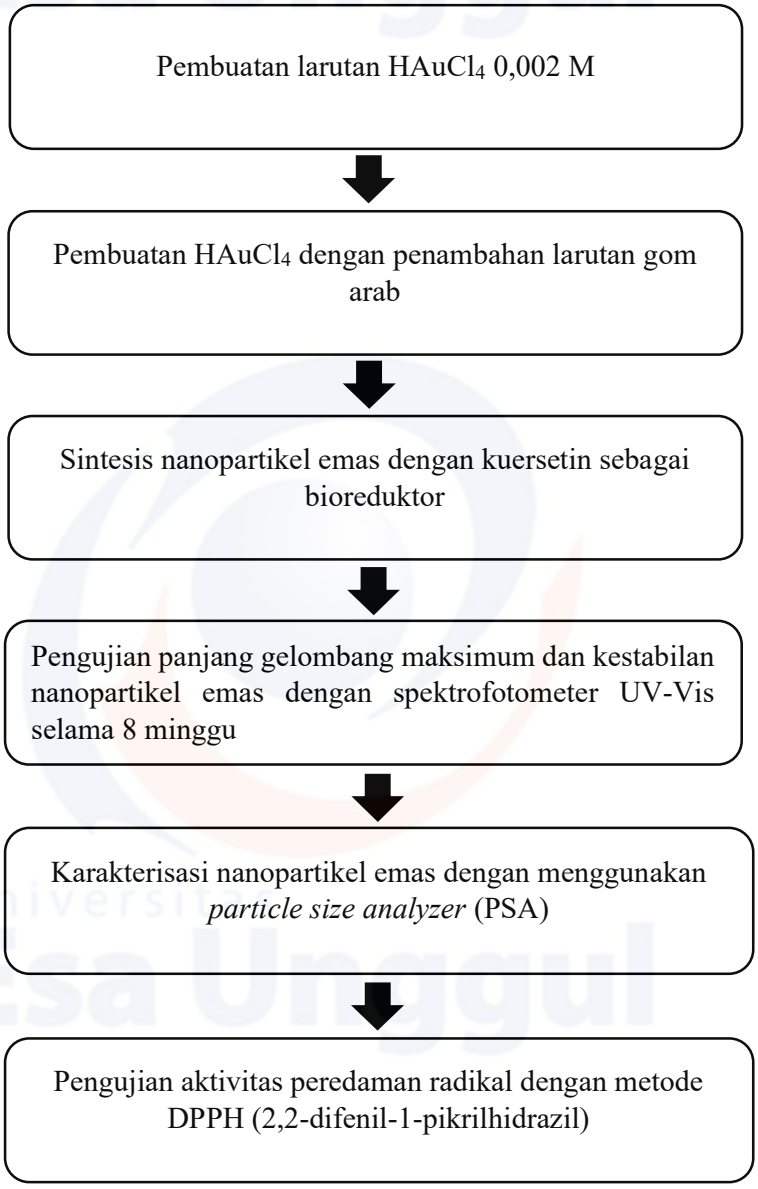


Metanol

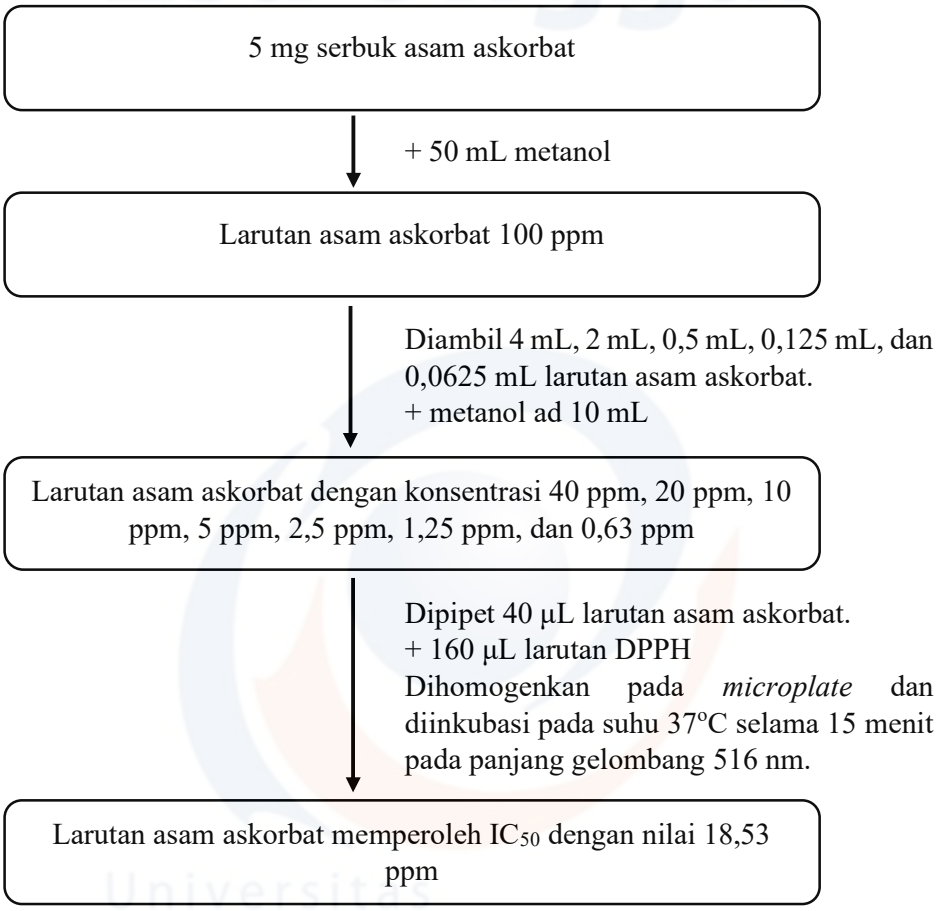


Asam Askorbat

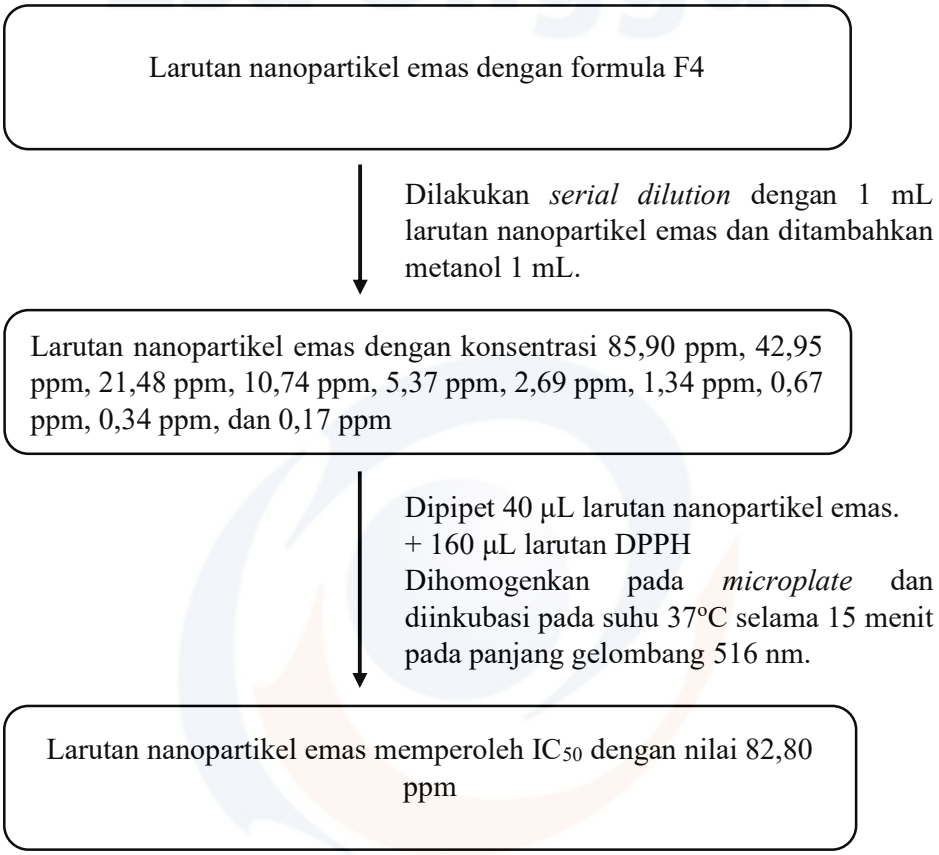
Lampiran 8. Skema Kerja



Lampiran 9. Skema Penentuan Aktivitas Antioksidan Larutan Standar



Lampiran 10. Skema Penentuan Aktivitas Antioksidan Nanopartikel Emas



Lampiran 11. Perhitungan Larutan $HAuCl_4$

1. Pembuatan Larutan $HAuCl_4$ 0,02 M

$$M = \frac{gr}{Mr} \times \frac{1000}{Volume}$$
$$= \frac{0,12}{196,967} \times \frac{1000}{30}$$
$$= \frac{4}{196,967}$$
$$= 0,02\ M$$

$HAuCl_4$ 0,002 M

$V_1 \times M_1 = V_2 \times M_2$

30 mL x 0,02 M $= V_2$ x 0,002 M

$\frac{0,6}{0,002} = V_2$

300 mL $= V_2$

Untuk membuat larutan $HAuCl_4$ 0,002 M ditambahkan 300 mL HCl 0,01 M.

2. Pembuatan Larutan HCl 0,01 M

HCl pekat (37%) memiliki molaritas sebesar 12,04 M atau 12 M.

$V_1 \times M_1 = V_2 \times M_2$

V_1 x 12 M= 500 mL x 0,01 M

$12V_1 = 5$

$V_1 = \frac{5}{12} = 0,4$ mL HCl

3. Pembuatan Larutan $HAuCl_4$ dengan Penambahan Gom Arab

Larutan gom arab:

3,000 gram gom arab dilarutkan dalam 250 mL *aqua pro injection*.

Larutan gom arab $= \frac{8,2}{10}$ x 250 mL $= 205$ mL

Aqua pro injection $= \frac{0,3}{10}$ x 250 mL $= 7,5$ mL

$HAuCl_4$ $= \frac{1,5}{10}$ x 250 mL $= 37,5$ mL

Lampiran 12. Perhitungan Pembuatan Larutan Kuersetin

1. Pembuatan Larutan Kuersetin sebagai Bioreduktor

$$M = \frac{gr}{Mr} \times \frac{1000}{Volume}$$

$$gr = \frac{M \times Mr \times V}{1000}$$

   a. Larutan kuersetin dengan konsentrasi 2 mM

$$gr = \frac{M \times Mr \times V}{1000}$$

$$= \frac{2 \times 302{,}24 \times 25}{1000}$$

$$= 0{,}01512 \text{ gram} = 15{,}112 \text{ mg}$$

   b. Larutan kuersetin dengan konsentrasi 4 mM

$$gr = \frac{M \times Mr \times V}{1000}$$

$$= \frac{4 \times 302{,}24 \times 25}{1000}$$

$$= 0{,}030224 \text{ gram} = 30{,}224 \text{ mg}$$

   c. Larutan kuersetin dengan konsentrasi 8 mM

$$gr = \frac{M \times Mr \times V}{1000}$$

$$= \frac{8 \times 302{,}24 \times 25}{1000}$$

$$= 0{,}060448 \text{ gram} = 60{,}448 \text{ mg}$$

Lampiran 13. Perhitungan Pengujian Aktivitas Antioksidan

1. Pembuatan larutan DPPH 0,05 mM
   DPPH 0,05 mM dalam 50 mL metanol (99,9%)
   Mr DPPH = 394,33 g/mol
   Mol DPPH = 50 mL x 0,05 mM = 50 mL x $\frac{0{,}05\ \text{mM}}{1000}$
   = 0,0025 mmol
   Mg DPPH = 0,0025 mmol x Mr DPPH
   = 0,0025 mmol x 394,33 g/mol
   = 0,985 mg = 1 mg

2. Pembuatan larutan standar asam askorbat 100 ppm
   Asam askorbat 100 ppm dalam 50 mL metanol (99,9%)
   ppm $= \frac{\text{mg}}{\text{L}}$
   $= \frac{5\ \text{mg}}{0{,}05\ \text{L}}$
   = 100 ppm

3. Pembuatan variasi konsentrasi larutan asam askorbat
   $V_1 \times M_1 = V_2 \times M_2$
   a. Larutan asam askorbat 40 ppm
      $V_1 \times M_1 = V_2 \times M_2$
      $V_1 = \frac{10\ \text{mL} \times 40\ \text{ppm}}{100\ \text{ppm}}$ = 4 mL asam askorbat
      Untuk membuat larutan asam askorbat 40 ppm diperlukan larutan induk 100 ppm sebanyak 4 mL dan ditambahkan dengan metanol ad 10 mL.
   b. Larutan asam askorbat 20 ppm
      $V_1 \times M_1 = V_2 \times M_2$
      $V_1 = \frac{10\ \text{mL} \times 20\ \text{ppm}}{100\ \text{ppm}}$ = 2 mL asam askorbat
      Untuk membuat larutan asam askorbat 20 ppm diperlukan larutan induk 100 ppm sebanyak 2 mL dan ditambahkan dengan metanol ad 10 mL.
   c. Larutan asam askorbat 10 ppm
      $V_1 \times M_1 = V_2 \times M_2$
      $V_1 = \frac{10\ \text{mL} \times 10\ \text{ppm}}{100\ \text{ppm}}$ = 1 mL asam askorbat
      Untuk membuat larutan asam askorbat 10 ppm diperlukan larutan induk 100 ppm sebanyak 1 mL dan ditambahkan dengan metanol ad 10 mL.
   d. Larutan asam askorbat 5 ppm
      $V_1 \times M_1 = V_2 \times M_2$

$$V_1 = \frac{10 \text{ mL x } 5 \text{ ppm}}{100 \text{ ppm}} = 0{,}5 \text{ mL asam askorbat}$$

Untuk membuat larutan asam askorbat 5 ppm diperlukan larutan induk 100 ppm sebanyak 0,5 mL dan ditambahkan dengan metanol ad 10 mL.

e. Larutan asam askorbat 2,5 ppm

$V_1 \times M_1 = V_2 \times M_2$

$$V_1 = \frac{10 \text{ mL x } 2{,}5 \text{ ppm}}{100 \text{ ppm}} = 0{,}25 \text{ mL asam askorbat}$$

Untuk membuat larutan asam askorbat 2,5 ppm diperlukan larutan induk 100 ppm sebanyak 0,25 mL dan ditambahkan dengan metanol ad 10 mL.

f. Larutan asam askorbat 1,25 ppm

$V_1 \times M_1 = V_2 \times M_2$

$$V_1 = \frac{10 \text{ mL x } 1{,}25 \text{ ppm}}{100 \text{ ppm}} = 0{,}125 \text{ mL asam askorbat}$$

Untuk membuat larutan asam askorbat 1,25 ppm diperlukan larutan induk 100 ppm sebanyak 0,125 mL dan ditambahkan dengan metanol ad 10 mL.

g. Larutan asam askorbat 0,625 ppm

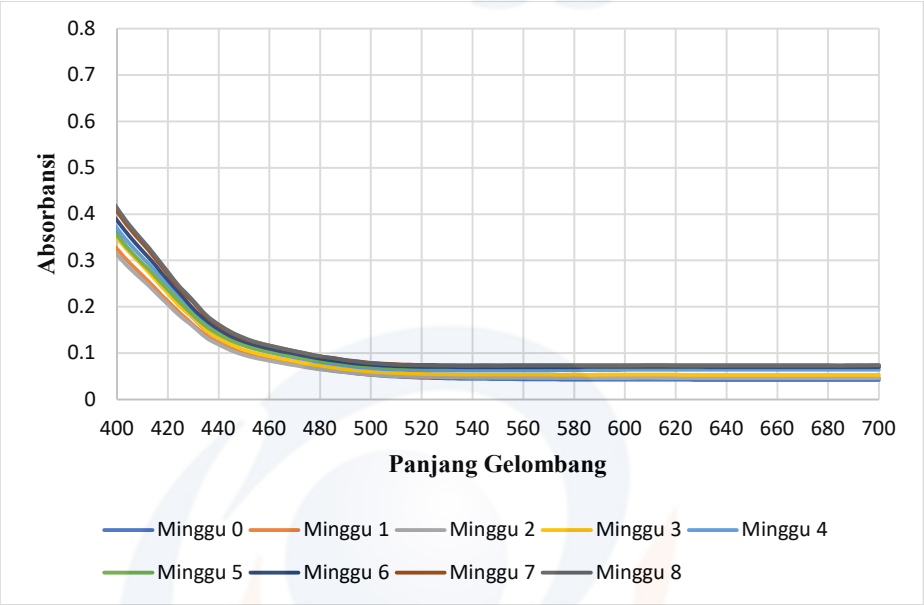
$V_1 \times M_1 = V_2 \times M_2$

$$V_1 = \frac{10 \text{ mL x } 0{,}625 \text{ ppm}}{100 \text{ ppm}} = 0{,}0625 \text{ mL asam askorbat}$$

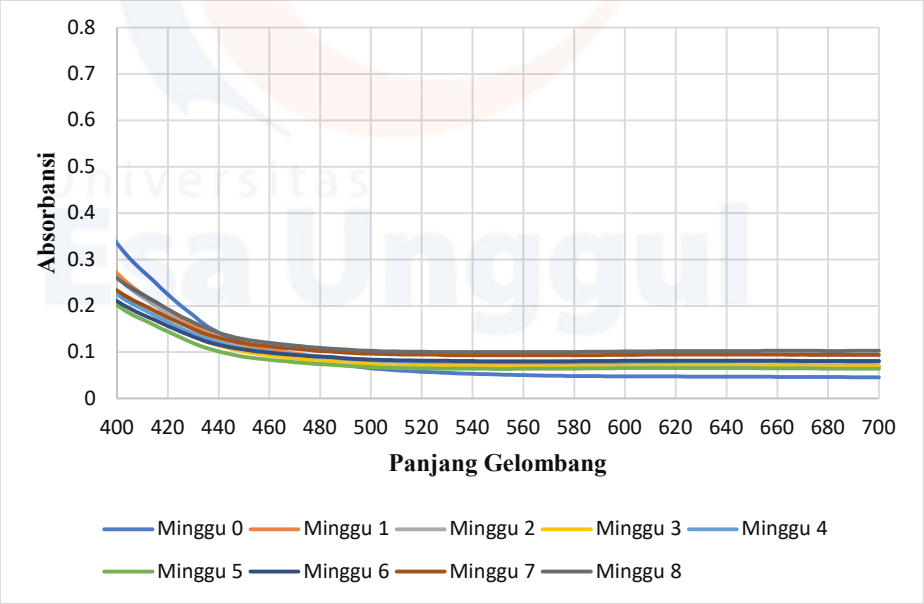
Untuk membuat larutan asam askorbat 0,625 ppm diperlukan larutan induk 100 ppm sebanyak 0,0625 mL dan ditambahkan dengan metanol ad 10 mL.

Lampiran 14. Hasil Uji Kestabilan Nanopartikel Emas selama 8 Minggu

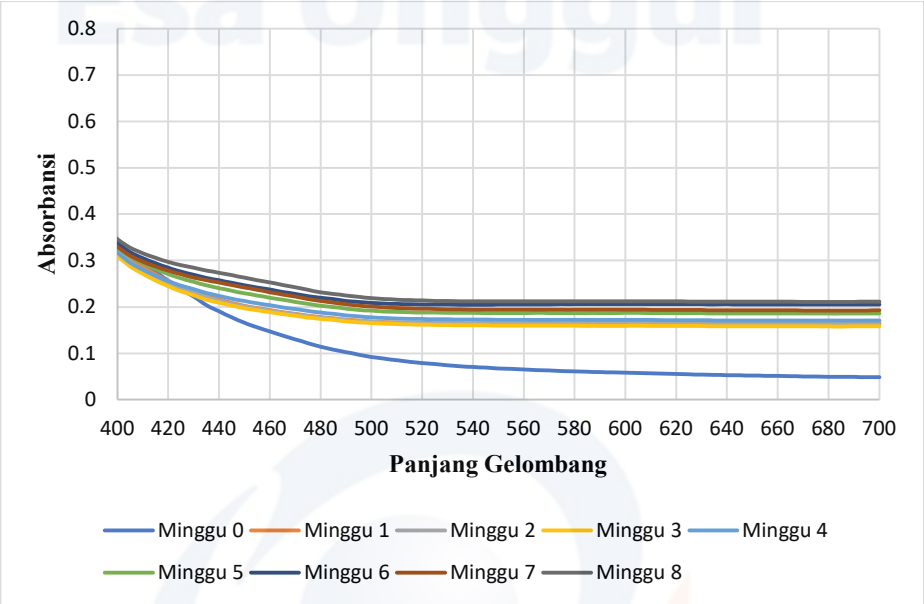
a. Kestabilan F1 selama 8 minggu



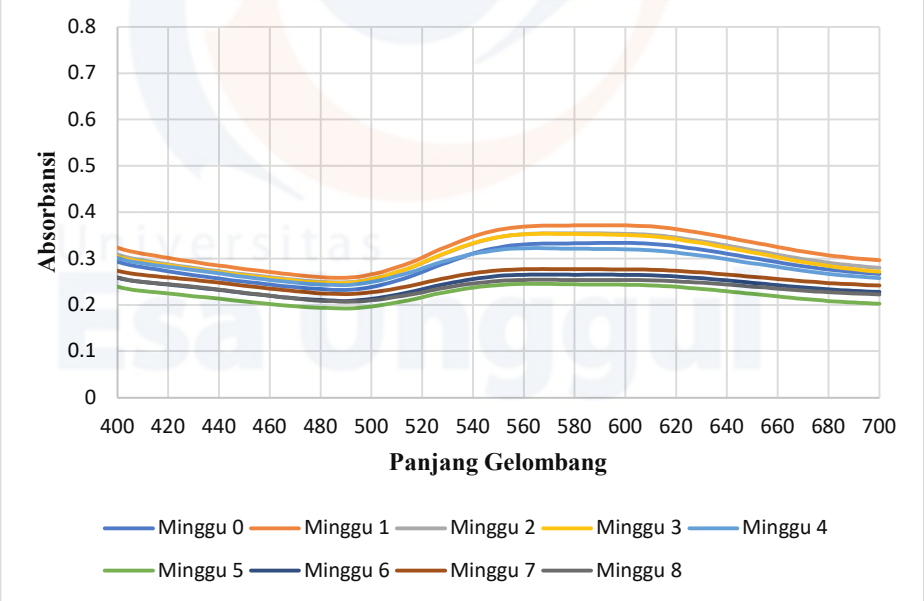
b. Kestabilan F2 selama 8 minggu



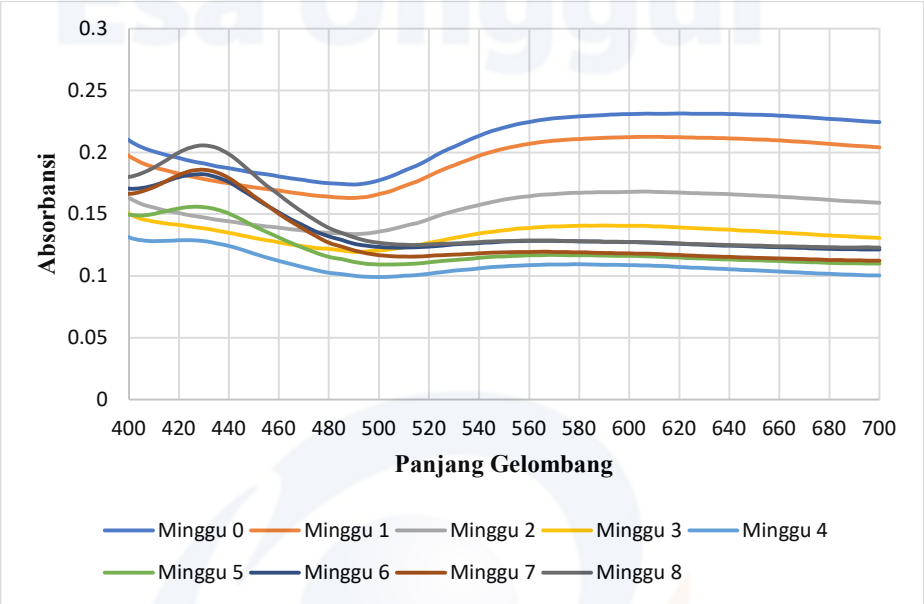
c. Kestabilan F3 selama 8 minggu



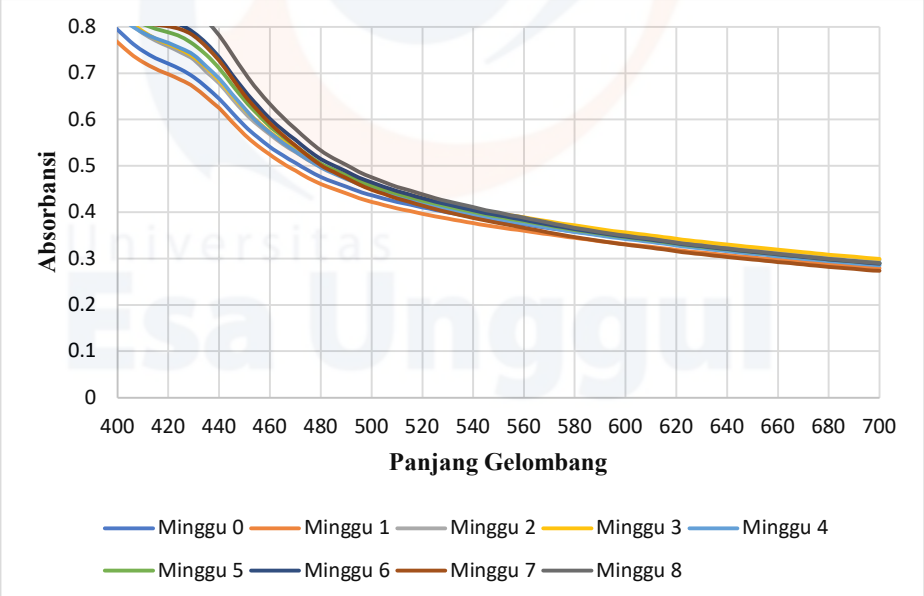
d. Kestabilan F4 selama 8 minggu



e. Kestabilan F5 selama 8 minggu

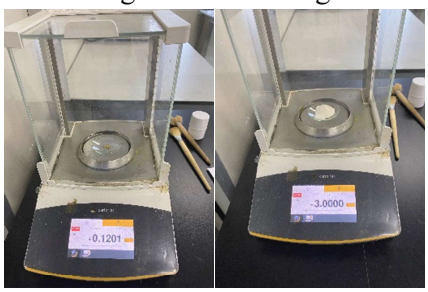


f. Kestabilan F6 selama 8 minggu



Lampiran 15. Dokumentasi

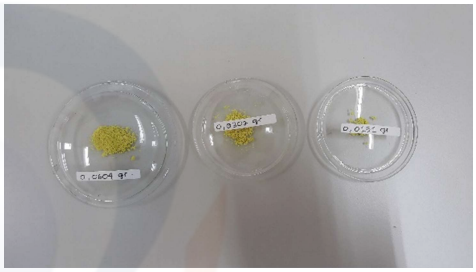
Penimbangan Au foil dan gom arab



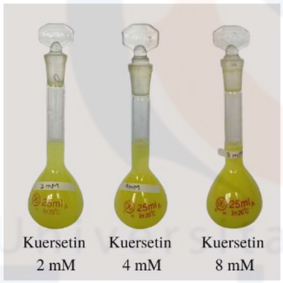
Pembuatan HCl 0,01 M

Penimbangan kuersetin 2, 4, dan 8 mM

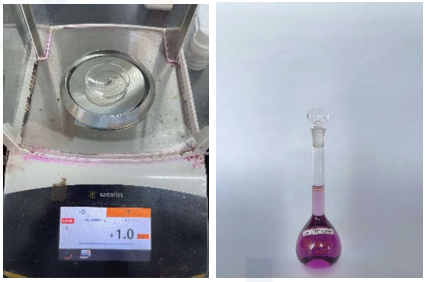
Hasil penimbangan kuersetin



Kuersetin dengan DMSO dan API

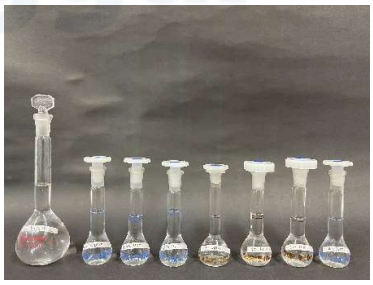


Penimbangan dan pelarutan DPPH



Penimbangan serbuk asam askorbat

Variasi konsentrasi larutan asam askorbat



Variasi konsentrasi nanopartikel emas

Lampiran 16. Larutan $HAuCl_4$ setelah Penyimpanan 8 Minggu