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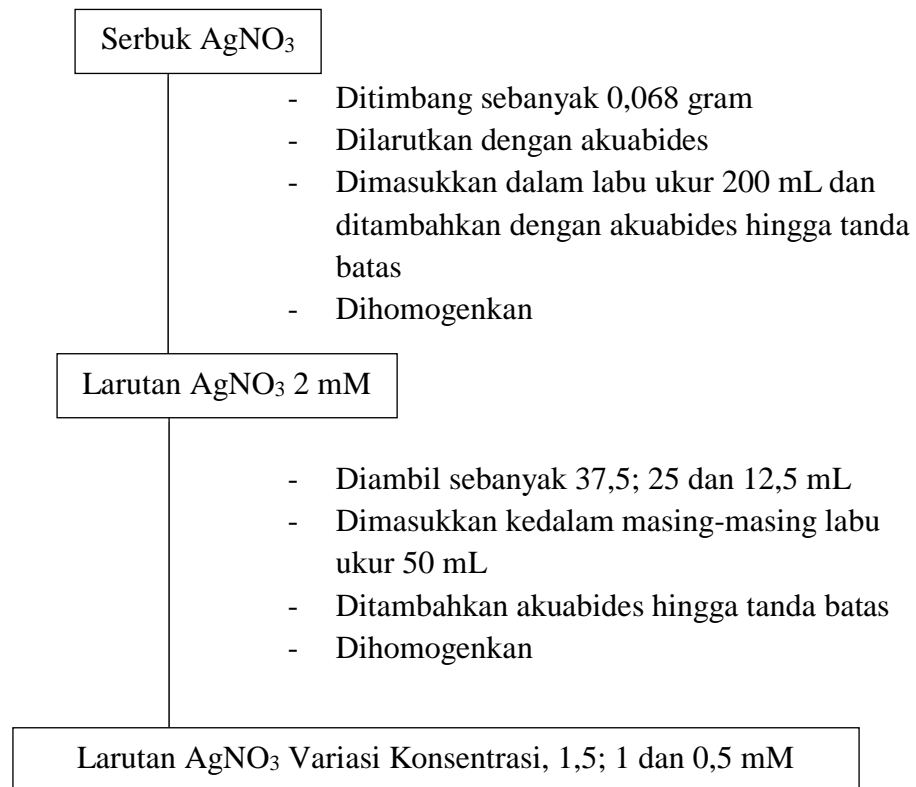


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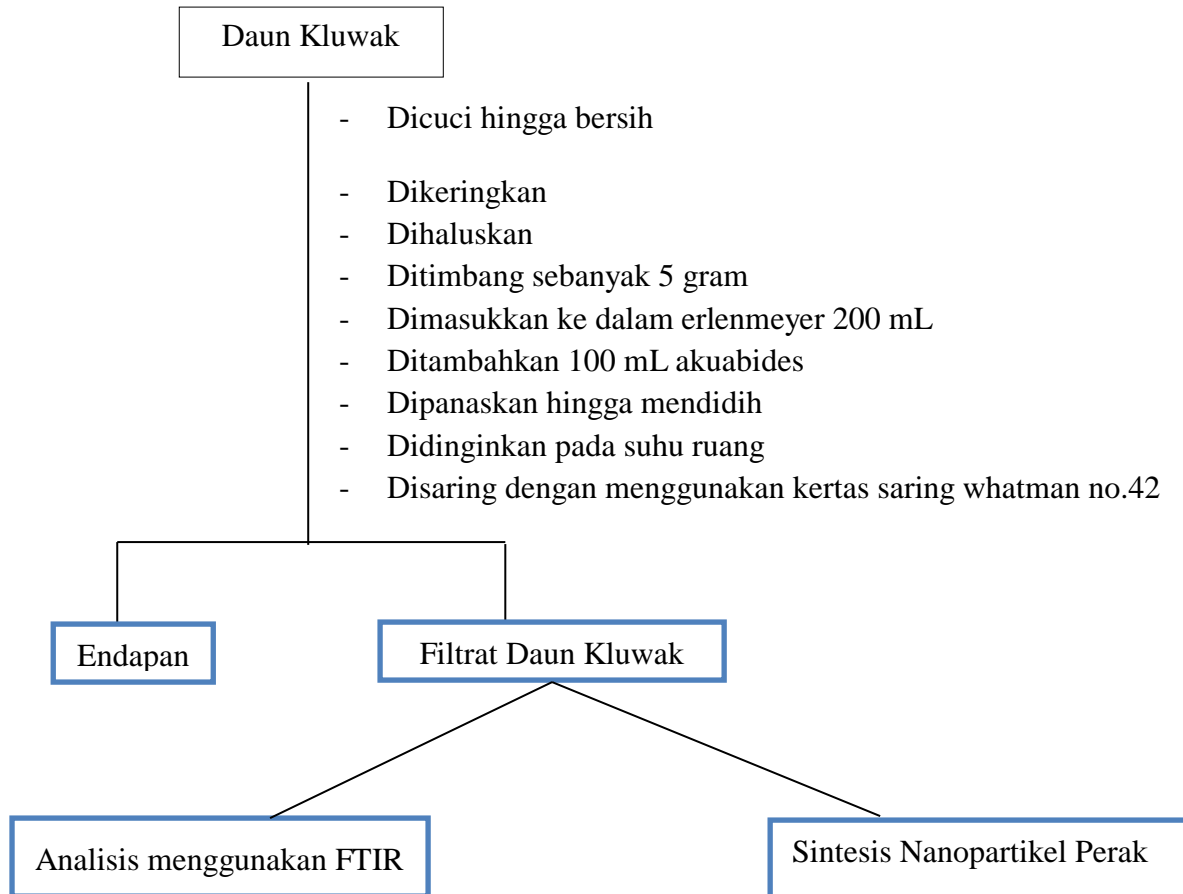


Lampiran 1. Bagan Kerja Penelitian

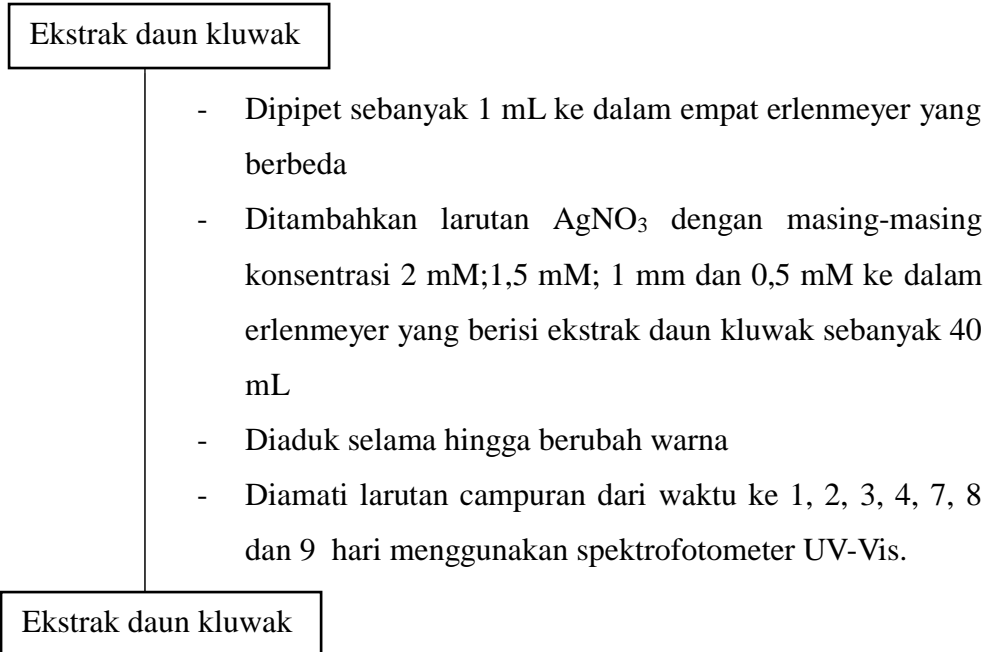
1. Pembuatan Larutan AgNO₃ Variasi Konsentrasi 2; 1,5; 1 dan 0,5 mM



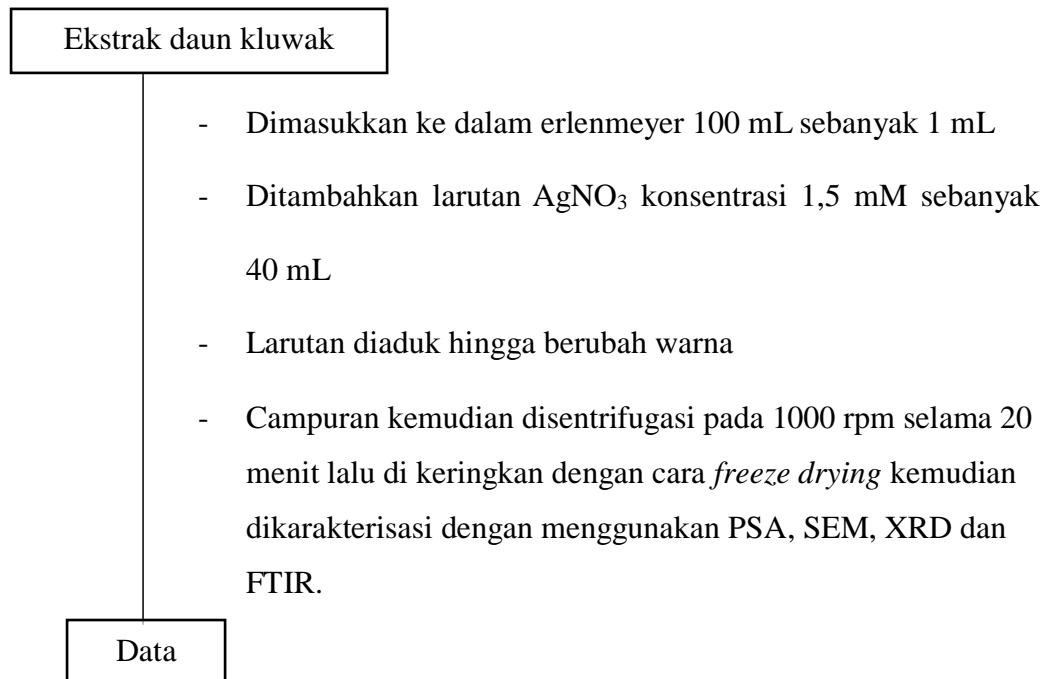
2. Pembuatan Ekstrak Kulit Daun Kluwak



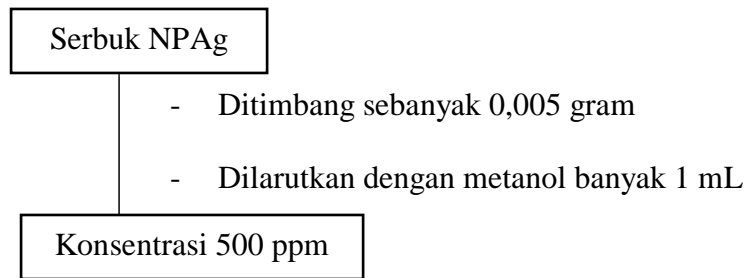
3. Optimasi variasi konsentrasi AgNO₃ Variasi Konsentrasi 2; 1,5; 1 dan 0,5 mM



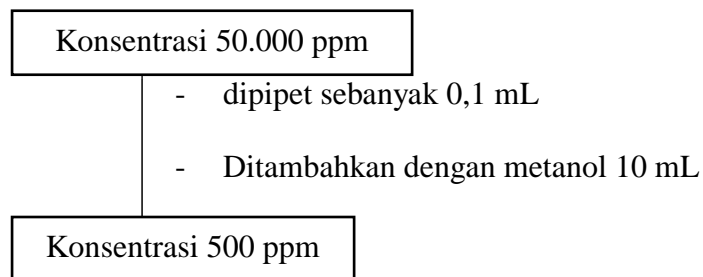
4. Sintesis nanopartikel perak



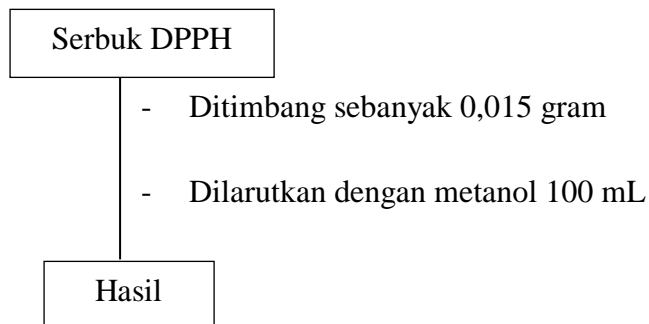
5. Pembuatan Larutan Induk Nanopartikel Perak 500 ppm



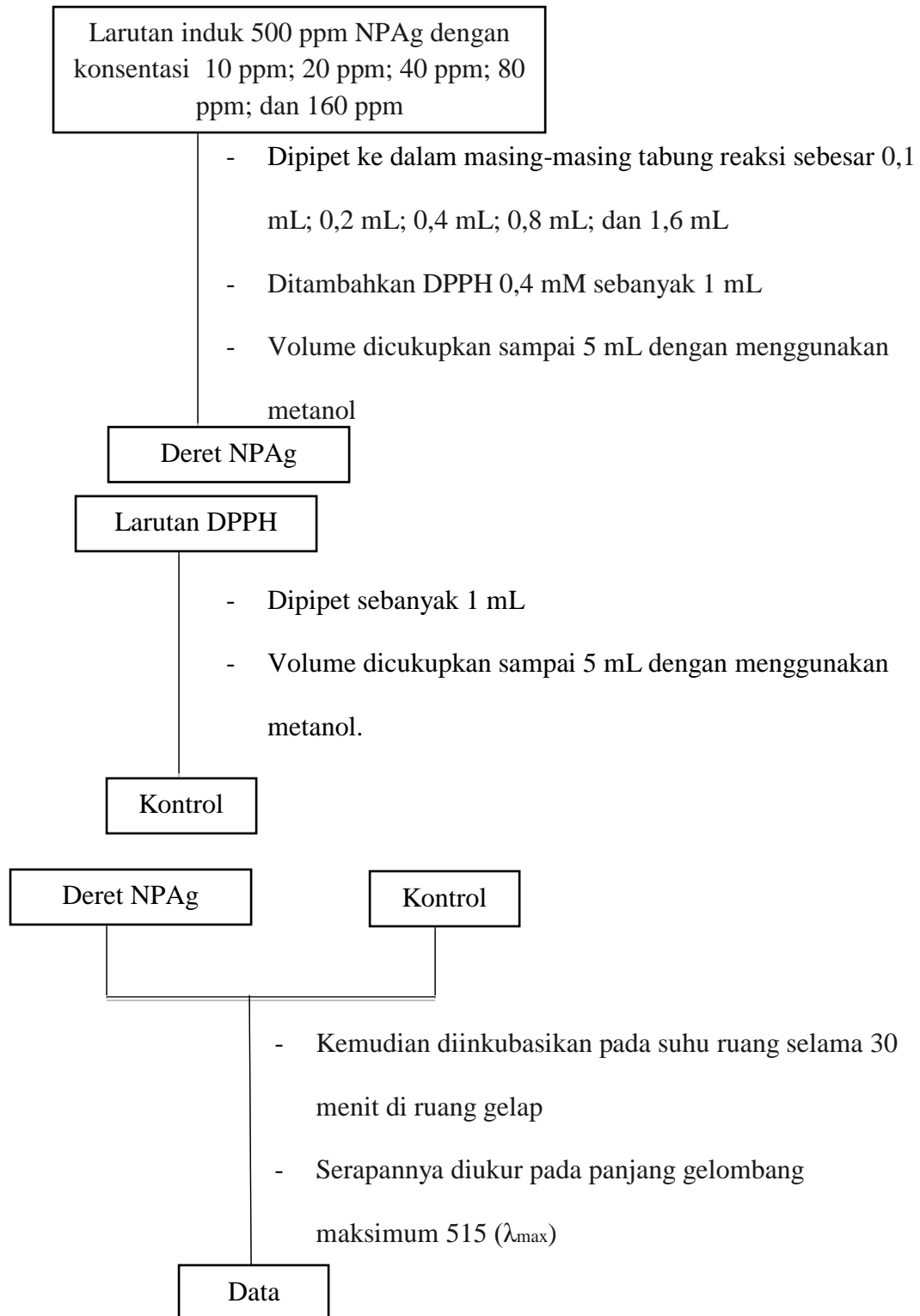
6. Pembuatan Larutan Induk Ekstrak Daun Kluwak 500 ppm



7. Pembuatan DPPH 0,4 Mm



8. Penentuan Aktivitas Antioksidan dengan Metode DPPH



Larutan blanko yang digunakan 5 mL metanol dan perlakuan yang sama terhadap asam askorbat sebagai kontrol positif dan ekstrak daun



Lampiran 2. Perhitungan

1. Perhitungan Ukuran Partikel

Persamaan Debye-Scherer

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

Keterangan:

D = Ukuran partikel (nm)

K = Faktor bentuk dari kristal (0,98)

λ = Panjang gelombang dari sinar X (1,54178 Å)

β = Nilai FWHM (rad)

θ = Sudut Bragg/sudut difraksi ($2\theta/2$)

Perhitungan Diameter Nanopartikel Perak

Dik: $2\theta = 37.8241$

$$\theta = \frac{37,8241}{2} = 18,8205$$

FWHM = 0,1745

Dit: D =?

Penye: $D = K\lambda/\beta \cdot \cos(\theta)$

$$D = \frac{(0,98) \times (0,154178)}{\left(\frac{3,14}{180} \times 0,1745\right) \times \cos(18,8205)}$$

$$\frac{0,151094}{0,003044 \times 0,946017}$$



$$= 52,46 \text{ nm}$$

Dik: $2\theta = 44,0621$

$$\theta = \frac{44,0621}{2} = 22,03105$$

FWHM = 0,1769

Dit: D =?

Penye: $D = K\lambda/\beta \cdot \cos(\theta)$

$$D = \frac{(0,98) \times (0,154178)}{\left(\frac{3,14}{180} \times 0,1769\right) \times \cos(22,03105)}$$

$$= \frac{0,151094}{0,003085 \times 0,926980}$$

$$= 52,81 \text{ nm}$$

Dik: $2\theta = 77,5417$

$$\theta = \frac{77,5417}{2} = 38,77085$$

FWHM = 0,2261

Dit: D =?

Penye: $D = K\lambda/\beta \cdot \cos(\theta)$

$$D = \frac{(0,98) \times (0,154178)}{\left(\frac{3,14}{180} \times 0,2261\right) \times \cos(38,77085)}$$

$$= \frac{0,151094}{0,003944 \times 0,776956}$$

49,13 nm
64,4279



$$\Theta = \frac{64,4279}{2} = 32,21395$$

$$\text{FWHM} = 0,19410$$

Dit: D =.....?

Penye: $D = K\lambda/\beta \cdot \cos(\theta)$

$$\begin{aligned} D &= \frac{(0,98) \times (0,154178)}{\left(\frac{3,14}{180} \times 0,19410\right) \times \cos(32,21395)} \\ &= \frac{0,151094}{0,003385 \times 0,846063} \\ &= 52,74 \text{ nm} \end{aligned}$$

2. Perhitungan Antioksidan

2.1 Pembuatan larutan induk Nanopartikel Perak 500 ppm dalam 10 mL metanol

$$\begin{aligned} \text{ppm} &= \frac{\text{mg}}{\text{L}} \\ 500 &= \frac{\text{mg}}{0,01} \\ \text{mg} &= 500 \times 0,01 \\ &= 5 \text{ mg} = 0,005 \text{ gram} \end{aligned}$$

2.2 Pembuatan larutan induk ekstrak Daun Kluwak 50.000 ppm dalam 100 mL akuabides

$$\begin{aligned} \text{ppm} &= \frac{\text{mg}}{\text{L}} \\ &= \frac{\text{mg}}{0,1} \\ &= 5.000 \text{ mg} = 5 \text{ gram} \end{aligned}$$



2.3 Pembuatan larutan induk ekstrak Daun Kluwak 500 ppm 10 mL metanol

$$C_1 \times V_1 = C_2 \times V_2$$

$$50.000 \times V_1 = 500 \times 10$$

$$V_1 = \frac{5.000}{50.000}$$

$$V_1 = 0,1 \text{ mL}$$

Volume metanol yang dibutuhkan = 10 mL - 0,1 mL = 9,9 mL

3. Perhitungan larutan deret standar nanopartikel perak dan ekstrak daun kluwak dari masing-masing 500 ppm

3.1 Pembuatan Larutan Konsentrasi 10 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$500 \text{ ppm} \times V_1 = 10 \text{ ppm} \times 5 \text{ mL}$$

$$V_1 = \frac{10 \text{ ppm} \times 5 \text{ mL}}{500 \text{ ppm}}$$

$$V_1 = 0,1 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (0,1 mL + 1 mL) = 3,9 mL

3.2 Pembuatan larutan konsentrassi 20 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$500 \text{ ppm} \times V_1 = 20 \text{ ppm} \times 5 \text{ mL}$$

$$V_1 = \frac{20 \text{ ppm} \times 5 \text{ mL}}{500 \text{ ppm}}$$

$$V_1 = 0,2 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (0,2 mL + 1 mL) = 3,8 mL



3.3 pembuatan larutan konsentrasi 40 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$500 \text{ ppm} \times V_1 = 40 \text{ ppm} \times 5 \text{ mL}$$

$$V_1 = \frac{40 \text{ ppm} \times 5 \text{ mL}}{500 \text{ ppm}}$$

$$V_1 = 0,4 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH= 5 mL - (0,4 mL + 1 mL)= 3,6 mL

3.4 pembuatan larutan konsentrasi 80 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$500 \text{ ppm} \times V_1 = 80 \text{ ppm} \times 5 \text{ mL}$$

$$V_1 = \frac{80 \text{ ppm} \times 5 \text{ mL}}{500 \text{ ppm}}$$

$$V_1 = 0,8 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH= 5 mL - (0,8 mL + 1 mL)= 3,2 mL

3.5 pembuatan larutan konsentrasi 160 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$500 \text{ ppm} \times V_1 = 160 \text{ ppm} \times 5 \text{ mL}$$

$$V_1 = \frac{160 \text{ ppm} \times 5 \text{ mL}}{500 \text{ ppm}}$$

$$V_1 = 1,6 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH= 5 mL - (1,6 mL + 1 mL)= 2,4 mL

4. Pembuatan DPPH 0,4 mM

$$C = \frac{M \times V}{Mr}$$

$$0,4 \times 0,1 \times 394,32$$

gram



5. Pembuatan Larutan Induk Asam Askorbat 500 ppm

$$\text{ppm} = \frac{\text{mg}}{\text{L}}$$

$$500 = \frac{\text{mg}}{0,01}$$

$$\text{mg} = 5 \text{ mg}$$

$$= 0,005 \text{ gram}$$

5.1 Pembuatan Larutan Asam Askorbat 5 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$500 \times V_1 = 5 \times 10$$

$$V_1 = 0,1 \text{ mL}$$

Volume total yang dibutuhkan sebesar 0,1 mL + 9,9 mL = 10 mL

6. Perhitungan larutan deret standar Asam Askorbat dari masing-masing 500 ppm

6.1 Pembuatan Larutan Konsentrasi 0,5 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$5 \times V_1 = 0,25 \times 5$$

$$V_1 = 0,25 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (1 + 0,25) = 3,75 mL

6.2 Pembuatan Larutan Konsentrasi 0,25 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$5 \times V_1 = 0,5 \times 5$$

$$V_1 = 0,5 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (1 + 0,5) = 3,5 mL



6.3 Pembuatan Larutan Konsentrasi 1 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$5 \times V_1 = 1 \times 5$$

$$V_1 = 1 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (1+1) = 3 mL

6.4 Pembuatan Larutan Konsentrasi 2 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$5 \times V_1 = 2 \times 5$$

$$V_1 = 2 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (1+2) = 2 mL

6.5 Pembuatan Larutan Konsentrasi 4 ppm

$$C_1 \times V_1 = C_2 \times V_2$$

$$5 \times V_1 = 4 \times 5$$

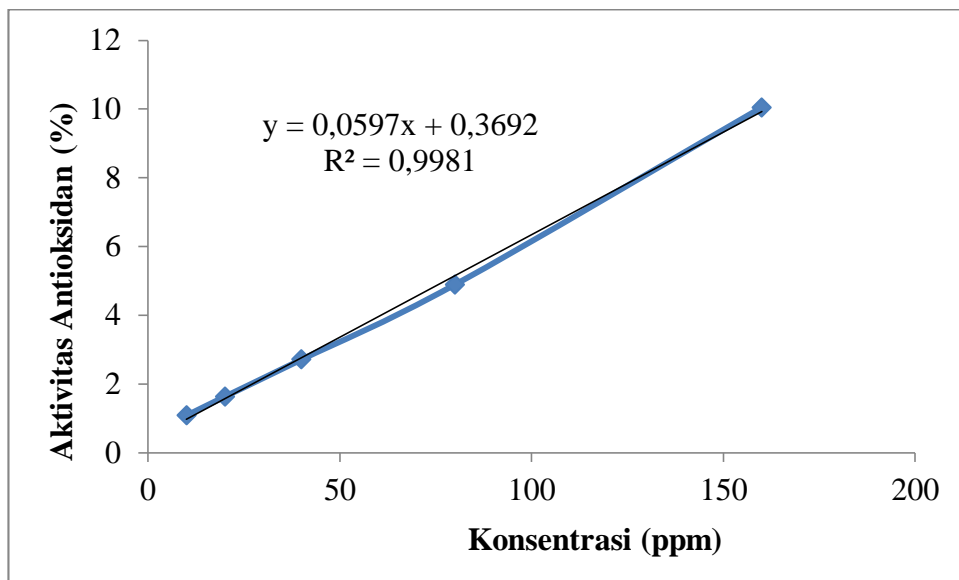
$$V_1 = 4 \text{ mL}$$

Volume metanol yang dibutuhkan dalam 1 mL DPPH = 5 mL - (1+4) = 0 mL



Lampiran 3. Kurva Pengukuran Aktivitas Antioksidan Ekstrak Daun Kluwak

No	Konsentrasi	Abrobansi sampel			Total	Kontrol	%inhibisi
		1	2	3			
1	10	0,365	0,365	0,364	0,364	0,368	1,08
2	20	0,363	0,363	0,362	0,362	0,368	1,63
3	40	0,358	0,358	0,358	0,358	0,368	2,71
4	80	0,350	0,350	0,350	0,350	0,368	4,89
5	160	0,332	0,330	0,332	0,331	0,368	10,05



$$\% \text{Aktivitas Antioksidan} = \frac{\text{Absorbansi Kontrol} - \text{Absorbansi Sampel}}{\text{Absorbansi Kontrol}} \times 100\%$$

1. Konsentrasi 10 ppm

$$\begin{aligned} \% \text{Inhibisi} &= \frac{0,368 - 0,364}{0,368} \times 100\% \\ &= 1,08\% \end{aligned}$$

2. Konsentrasi 20 ppm

$$\begin{aligned} &= \frac{0,368 - 0,362}{0,368} \times 100\% \\ &= 1,63\% \end{aligned}$$



3. Konsentrasi 40 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,368-0,358}{0,368} \times 100\% \\ &= 2,71\%\end{aligned}$$

4. Konsentrasi 80 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,368-0,350}{0,368} \times 100\% \\ &= 4,89\%\end{aligned}$$

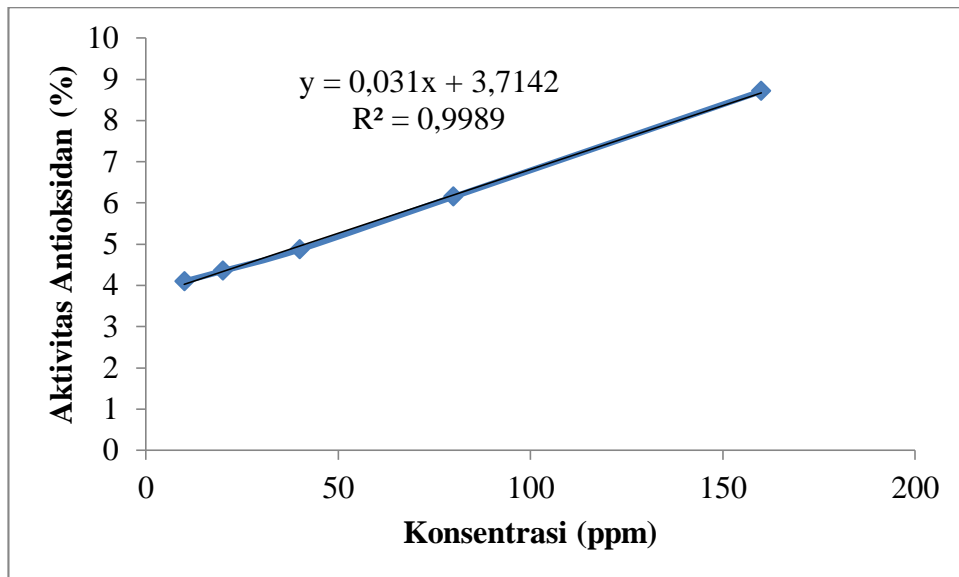
5. Konsentrasi 160 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,368-0,0,331}{0,368} \times 100\% \\ &= 10,05 \%\end{aligned}$$



Lampiran 4. Kurva Pengukuran Aktivitas Antioksidan Nanopartikel Perak

No	Konsentrasi	Abrobansi sampel			Total	Kontrol	%inhibisi
		1	2	3			
1	10	0,375	0,374	0,375	0,374	0,390	4,10
2	20	0,374	0,373	0,373	0,373	0,390	4,35
3	40	0,371	0,370	0,372	0,371	0,390	4,87
4	80	0,366	0,366	0,366	0,366	0,390	6,15
5	160	0,357	0,357	0,356	0,356	0,390	8,71



$$\% \text{Aktivitas Antioksidan} = \frac{\text{Absorbansi Kontrol} - \text{Absorbansi Sampel}}{\text{Absorbansi Kontrol}} \times 100\%$$

1. Konsentrasi 10 ppm

$$\begin{aligned} \% \text{Inhibisi} &= \frac{0,390 - 0,374}{0,390} \times 100\% \\ &= 4,10\% \end{aligned}$$

2. Konsentrasi 20 ppm

$$\begin{aligned} &= \frac{0,390 - 0,374}{0,390} \times 100\% \\ &= 4,35\% \end{aligned}$$



3. Konsentrasi 40 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,390 - 0,371}{0,390} \times 100\% \\ &= 4,87\%\end{aligned}$$

4. Konsentrasi 80 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,390 - 0,366}{0,390} \times 100\% \\ &= 6,15\%\end{aligned}$$

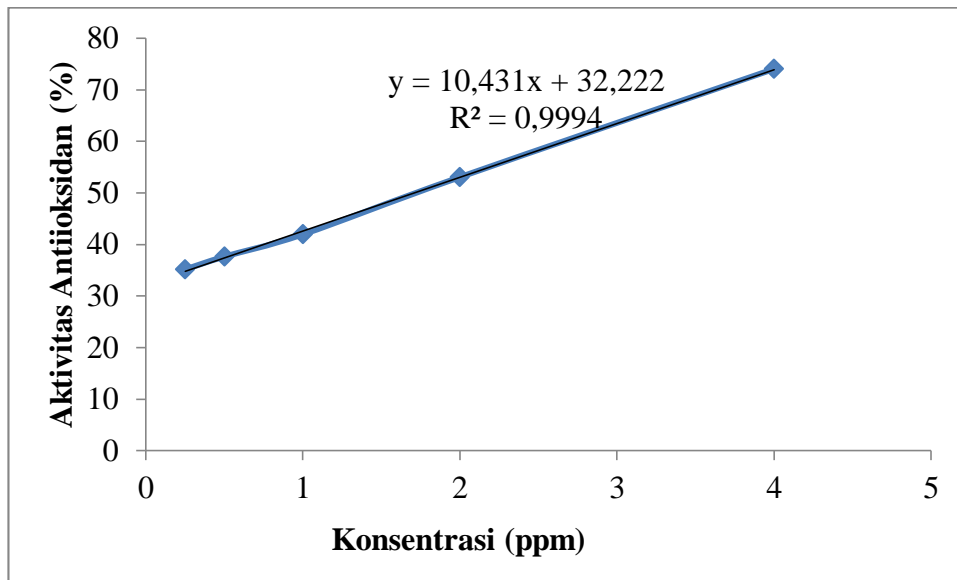
5. Konsentrasi 160 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,390 - 0,356}{0,390} \times 100\% \\ &= 8,71\%\end{aligned}$$



Lampiran 5. Kurva Pengukuran Aktivitas Antioksidan Asam Askorbat

No	Konsentrasi	Abrobansi sampel			Total	Kontrol	%inhibisi
		1	2	3			
1	0,25	0,105	0,106	0,105	0,105	0,162	35,18
2	0,5	0,101	0,102	0,100	0,101	0,162	37,65
3	1	0,093	0,094	0,095	0,094	0,162	41,97
4	2	0,076	0,077	0,077	0,076	0,162	53,08
5	4	0,042	0,045	0,041	0,042	0,162	74,07



$$\% \text{Aktivitas Antioksidan} = \frac{\text{Absorbansi Kontrol} - \text{Absorbansi Sampel}}{\text{Absorbansi Kontrol}} \times 100\%$$

1. Konsentrasi 0,25 ppm

$$\% \text{Inhibisi} = \frac{0,162 - 0,105}{0,162} \times 100\%$$

Konsentrasi 0,5 ppm

$$\% \text{Inhibisi} = \frac{0,162 - 0,101}{0,162} \times 100\%$$

$$= 37,65\%$$



2. Konsentrasi 1 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,162-0,094}{0,162} \times 100\% \\ &= 41,97\%\end{aligned}$$

3. Konsentrasi 2 ppm

$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,162-0,076}{0,162} \times 100\% \\ &= 53,08\%\end{aligned}$$

4. Konsentrasi 4 ppm

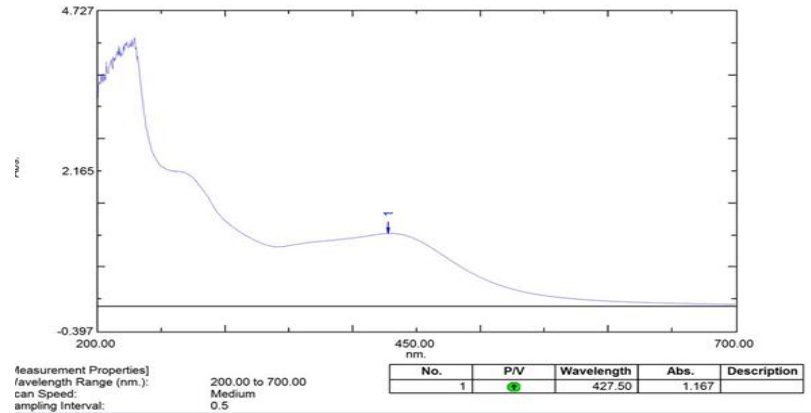
$$\begin{aligned}\% \text{Inhibisi} &= \frac{0,162-0,042}{0,162} \times 100\% \\ &= 74,07\%\end{aligned}$$



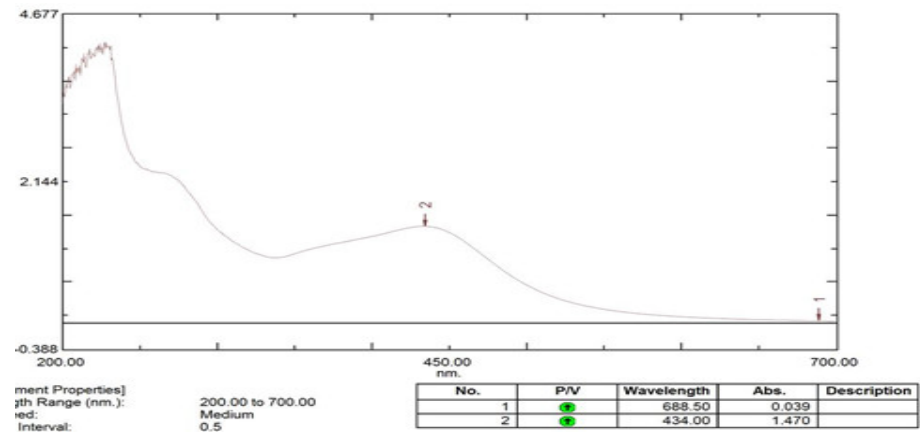
Lampiran 6. Data hasil Karakterisasi Nanopartikel Perak dengan menggunakan Spektrofotometer UV-Vis

1. Kosentrasi 2 Mm

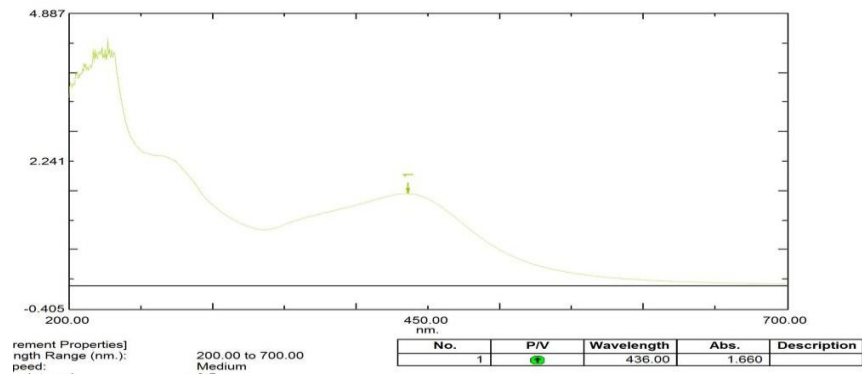
a. 1 hari



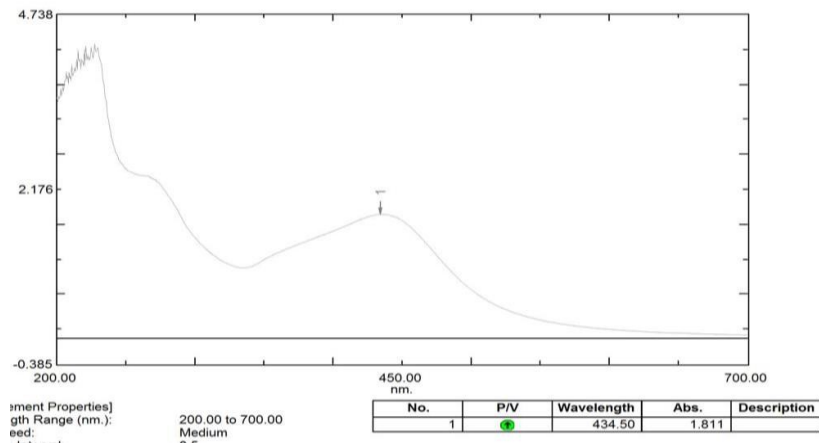
b. 2 hari



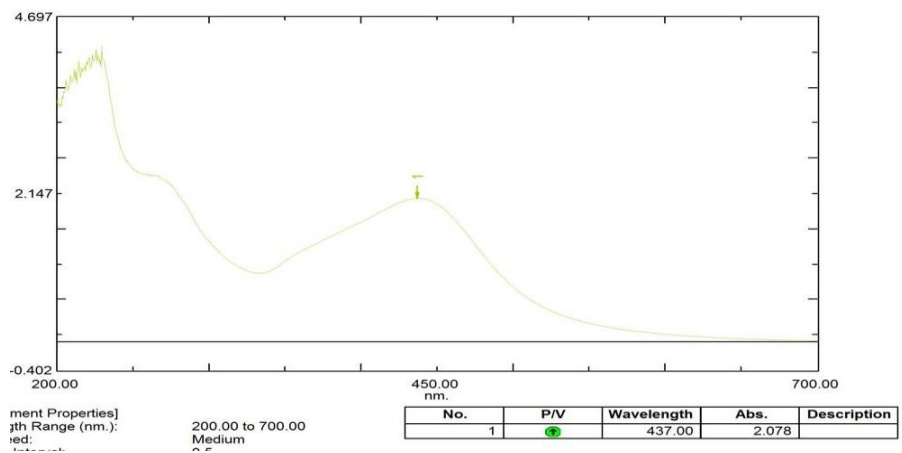
c. 3 hari



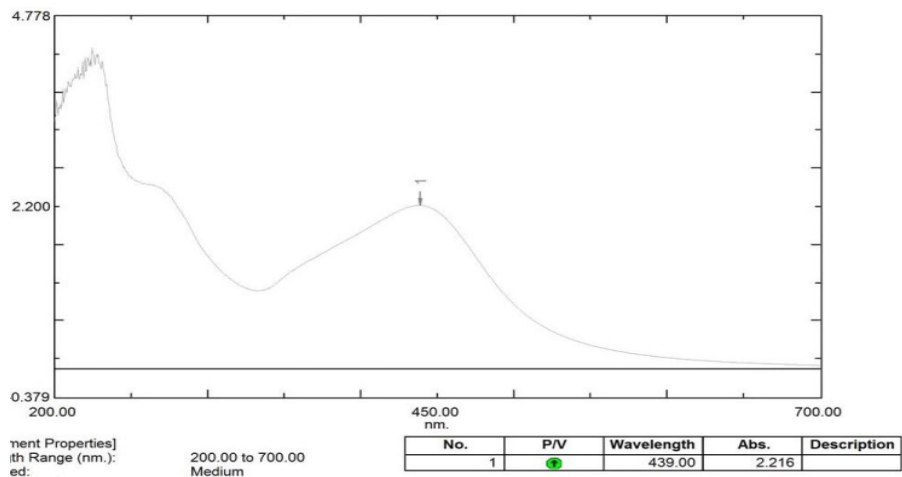
d. 4 hari



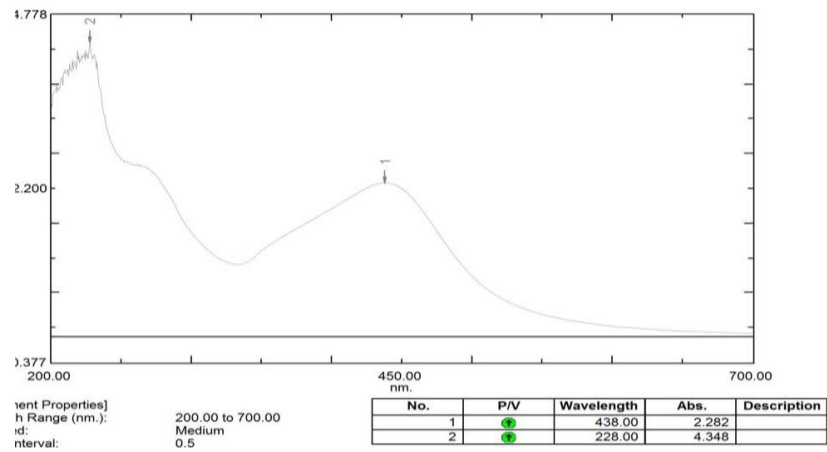
e. 7 Hari



f. 8 hari

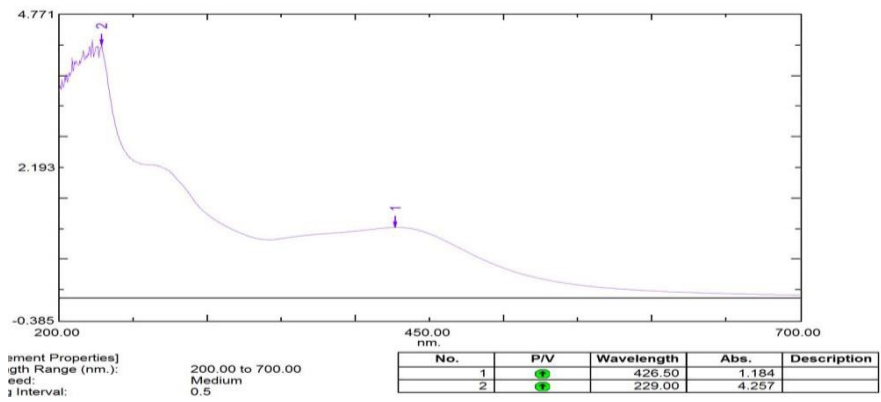


g. 9 Hari

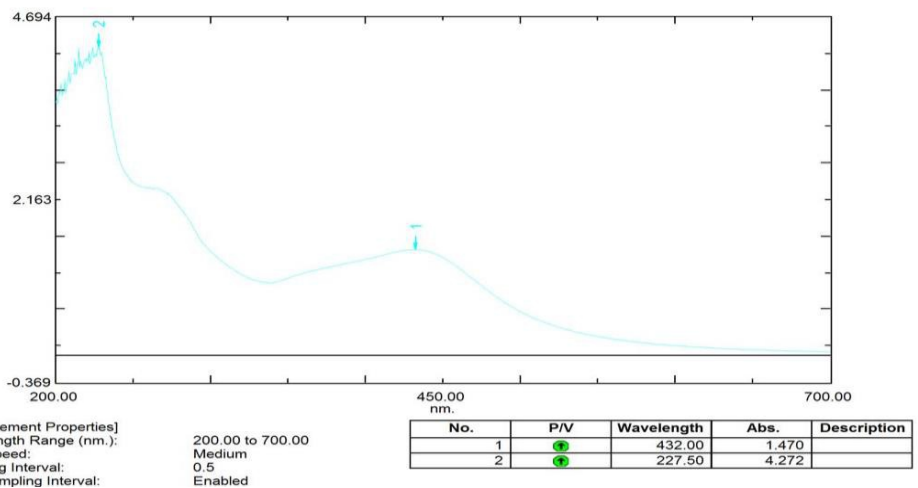


2. Konsentrasi 1,5 mM

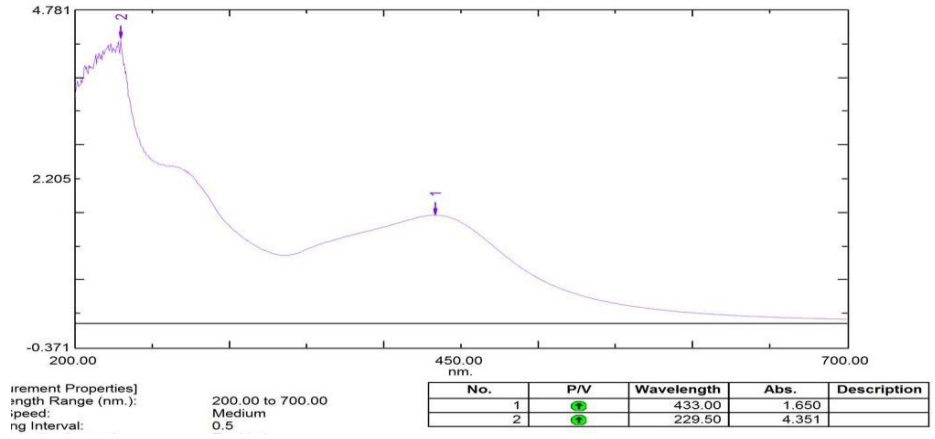
a. 1 hari



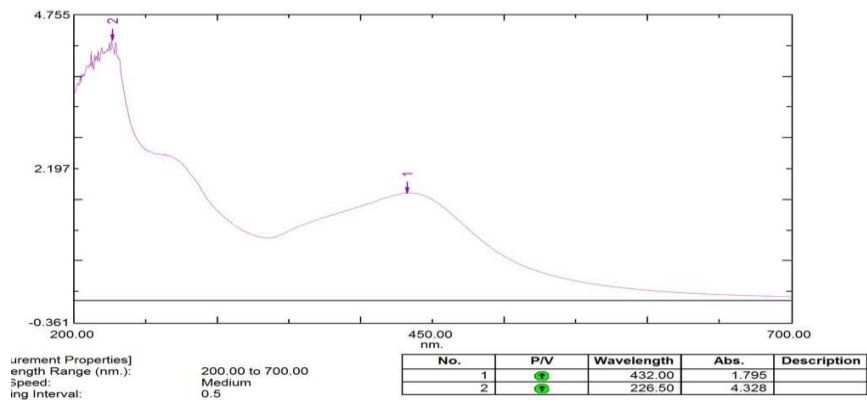
b. 2 hari



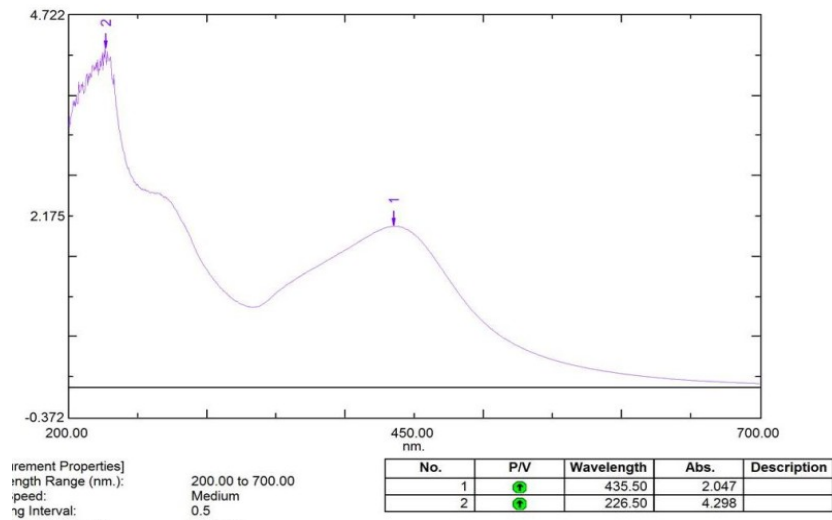
c. 3 hari



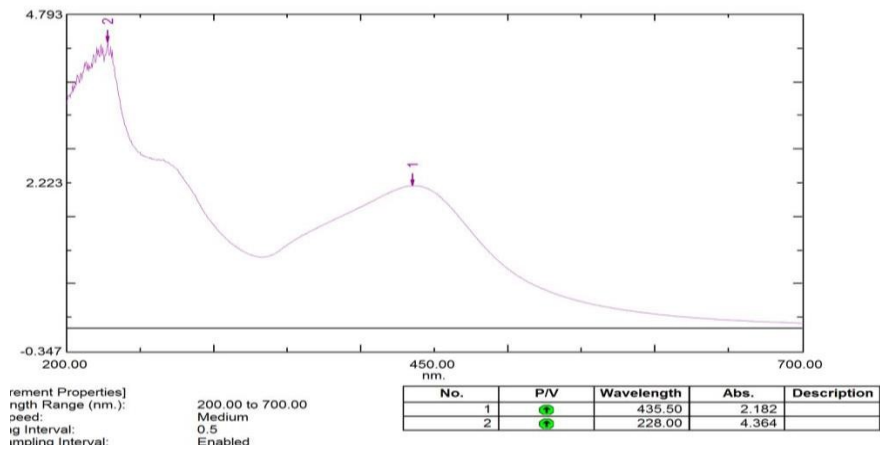
d. 4 hari



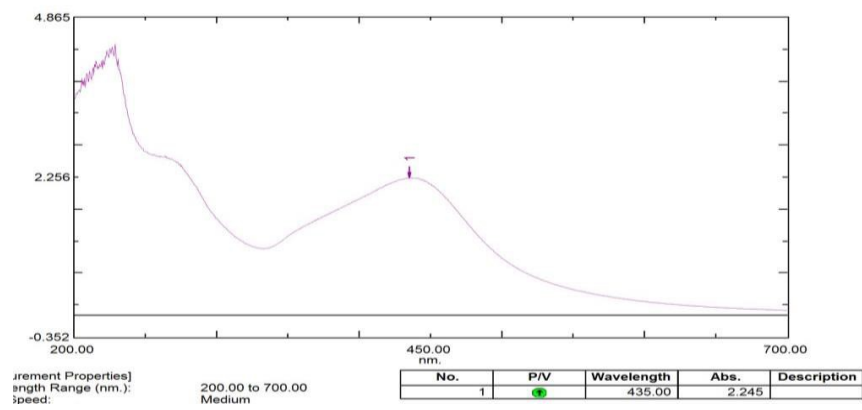
e. 7 hari



f. 8 hari

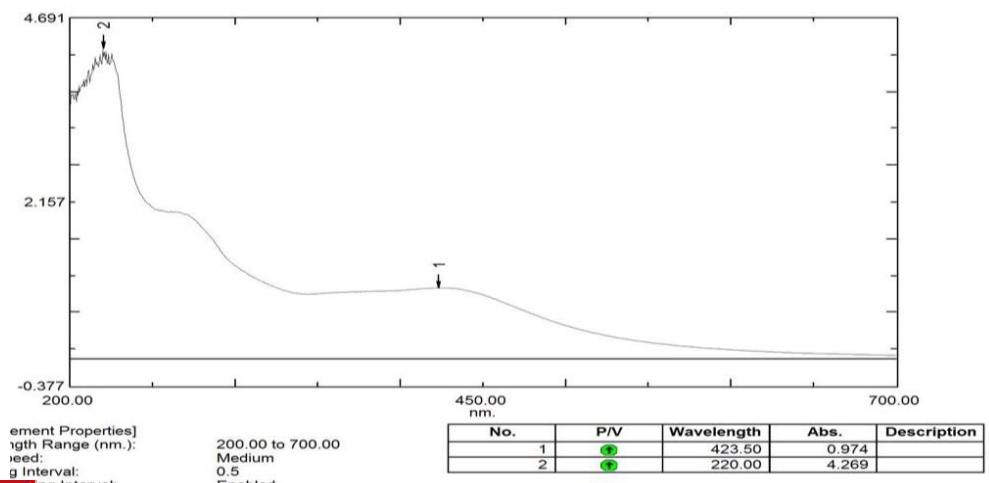


g. 9 hari

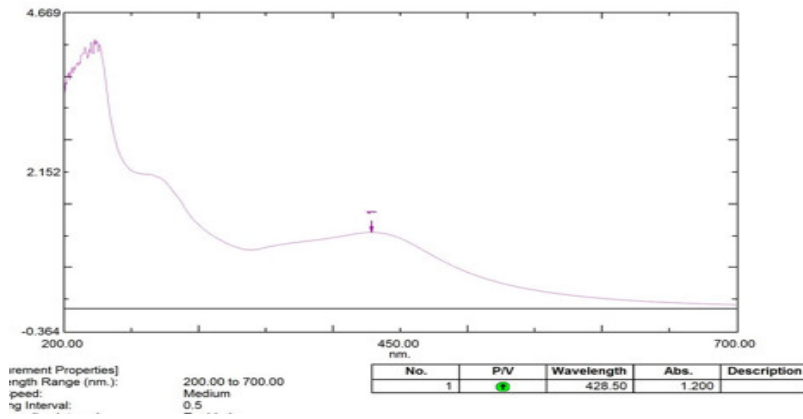


3. Konsentrasi 1 mM

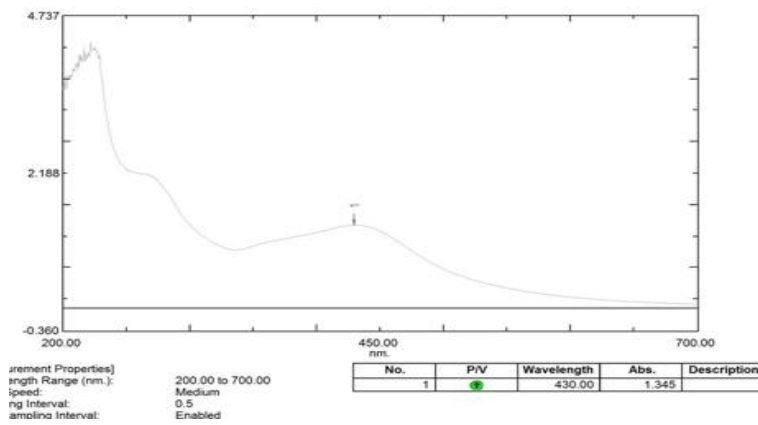
a. 1 hari



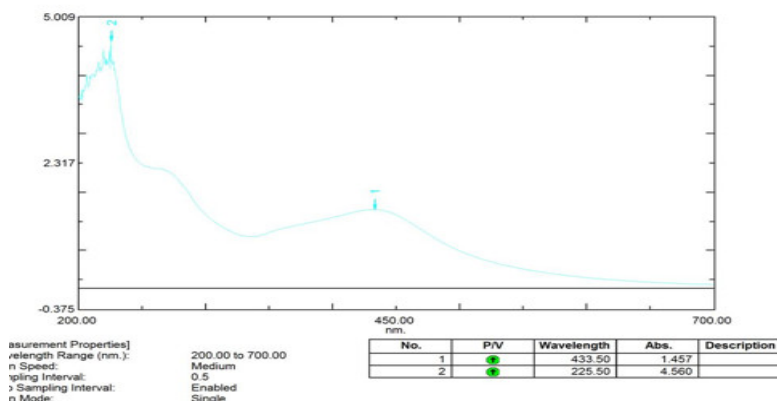
b. 2 hari



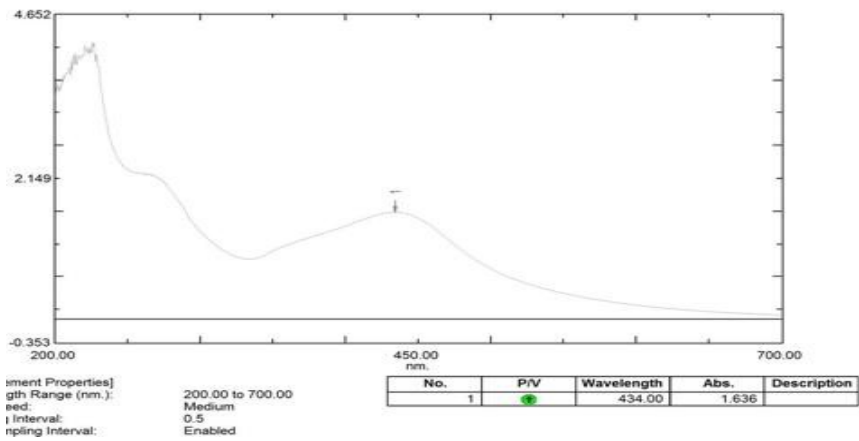
c. 3 hari



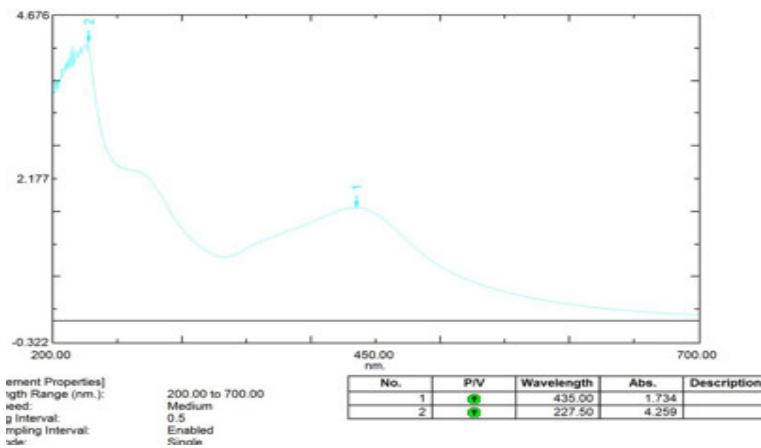
d. 4 hari



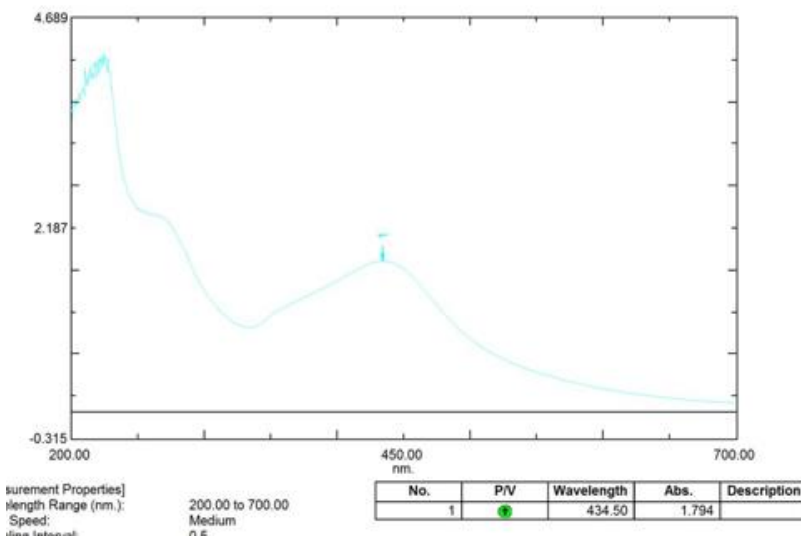
hari



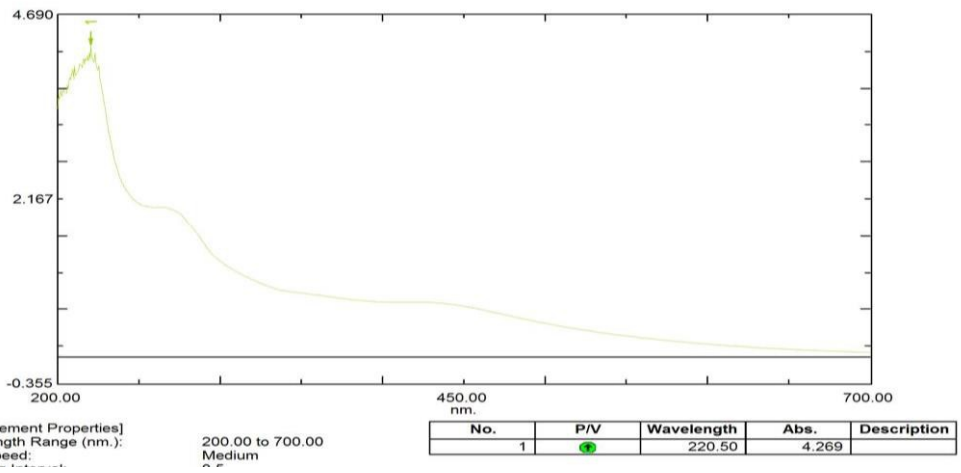
f. 8 hari



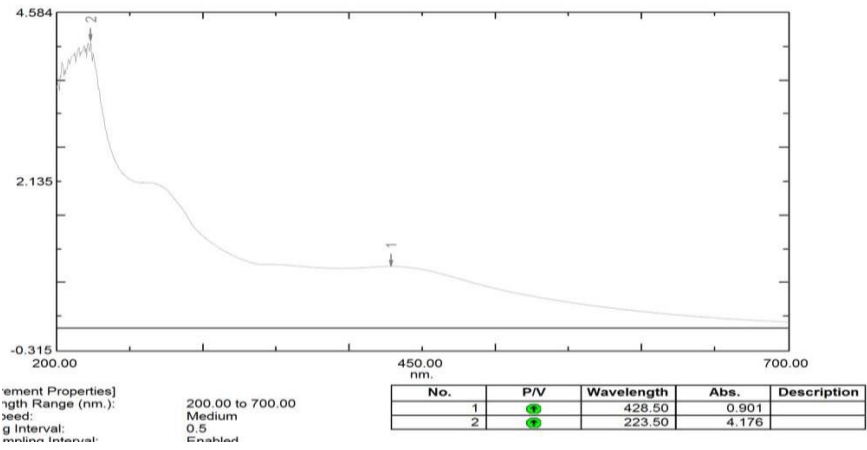
g. 9 hari



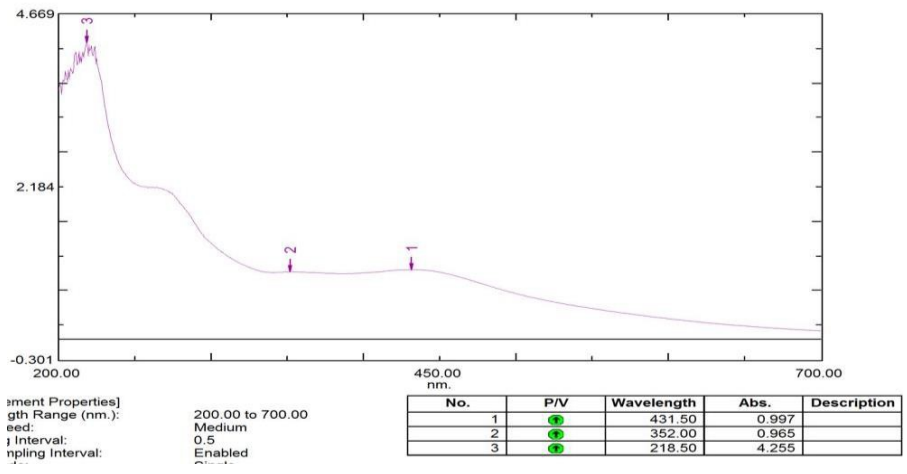
onsentrasi 0,5 mM
 hari



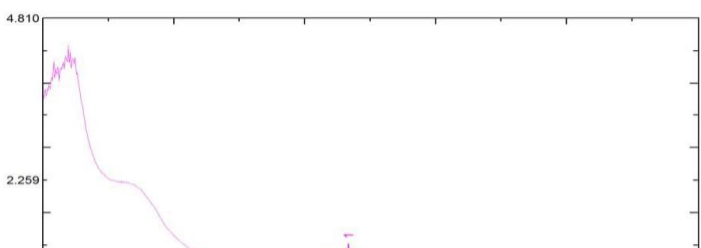
b. 2 hari



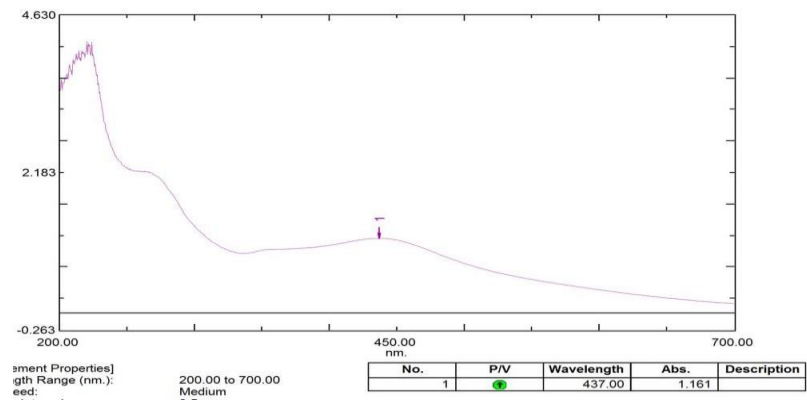
c. 3 hari



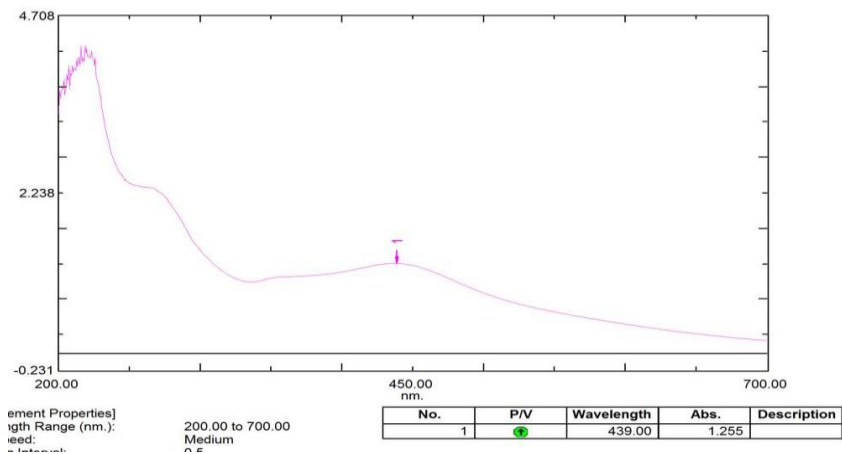
hari



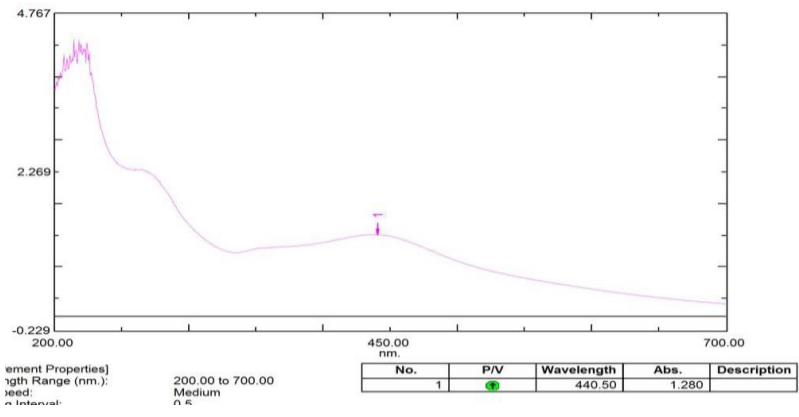
e. 7 hari



f. 8 hari



hari



Lampiran 7. Tabel λ_{maks} dan Absorbansi Nanopartikel Perak

1. Konsentrasi AgNO_3 2 mM

Waktu kontak (Hari)	λ_{maks} (nm)	absorbansi
1	427,50	1,167
2	434	1,470
3	436	1,660
4	434,50	1,811
7	437,50	2,078
8	439	2,219
9	438	2,282

2. Konsentrasi AgNO_3 1,5 mM

Waktu kontak (Hari)	λ_{maks} (nm)	absorbansi
1	426,50	1,187
2	432	1,470
3	433	1,650
4	432	1,765
7	435,50	2,047
8	435,50	2,182
9	435	2,245

3. Konsentrasi AgNO_3 1 mM

Waktu kontak (Hari)	λ_{maks} (nm)	absorbansi
1	423,50	0,974
2	428,50	1,200
3	430	1,345
4	433	1,457
7	434	1,636
8	435	1,734
9	434,50	1,794



4. Konsentrasi AgNO₃ 0,5 mM

Waktu kontak (Hari)	λ_{maks} (nm)	absorbansi
1	-	-
2	428	0,901
3	431	0,997
4	433	1,073
7	437	1,161
8	439	1,255
9	440	1,280



Lampiran 8. Hasil Pengukuran Nanopartikel Perak dengan Menggunakan *Particle size analyzer (PSA)*

Delsa™ Nano
Common



Condition Summary S/N : 123909

User : Common	Group :	Repetition : 1/1
Date : 9/13/2018	File Name : NP-Ag A_20180913_140334	
Time : 14:03:34	Sample Information :	
SOP Name : Sampel Uji PSA	Security : No Security	

Version 2.31 / 2.03

Measurement Condition

Sampling Time	: N/A	(μ s)	Correlation Method	: TD	
Correlation Channel	: 440	(ch)	Attenuator 1	: 47.16	(%)
Accumulation times	: 30	(times)	Pinhole	: 50	(μ m)
Cell Center	: Z : 3.000	(mm)			
	X : 7.500	(mm)			
Scattering Angle	: 165.0	($^{\circ}$)	Temperature	: 25.0	($^{\circ}$ C)
Diluent Name	: WATER		Viscosity	: 0.8878	(cP)
Refractive Index	: 1.3328				
Intensity	: 11397	(cps)			

Cumulants Results

Mean Diameter	(d) : 93.2	(nm)	Diffusion Constant	(D) : 5.281e-008	(cm^2/sec)
Polydispersity Index	(P.I.) : 0.296		Decay Constant	(Γ) : 3342.7	(1/sec)

Fitting Parameter

Analysis Method	: CONTIN			
	: 10.0 - 4000.0	(nm)	Cut	Left : 0 Right : 0
	: 1.003 - 2			
	: 0.3	(%)		
	: 9.183e-003 [OK]			



Delsa™ Nano

Intensity Distribution

S/N : 123909

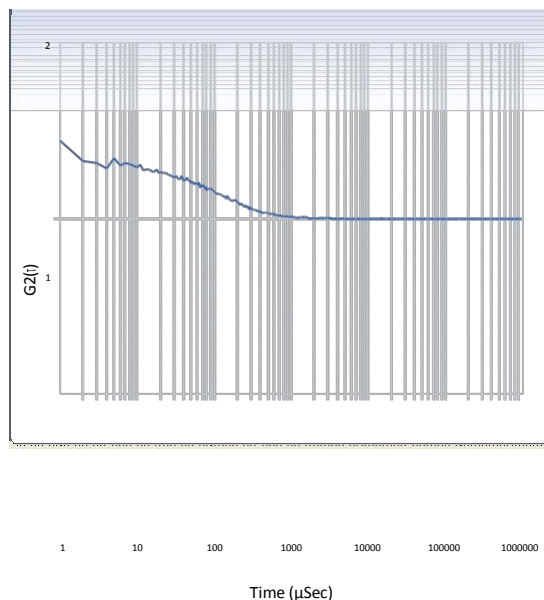
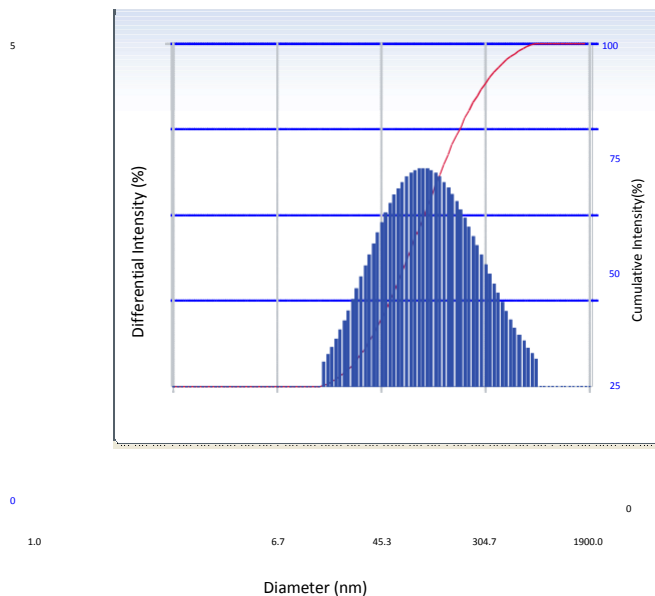
User : Common Group : Repetition : 1/1
 Date : 9/13/2018 File Name : NP-Ag A_20180913_140334
 Time : 14:03:34 Sample Information :

SOP Name : SampelUji PSA

Security : No Security

Version 2.31 / 2.03
 Intensity Distribution

ACF



Distribution Results (Contin)

Diameter	Peak	Polydispersity Index (PDI)	Diffusion Coef.	Std. Dev.
Measurement Condition 1	150.5	0.96	0.11	138.3
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
Average	150.5			138.3
Residual :	9.183e-003			(O.K)

Cumulants Results

(d) : 93.2
 (D) : 5.281e-008 (nm) (

Temperature : 25.0 (°C)
 Diluent Name : WATER
 Refractive Index : 1.3328
 Viscosity : 0.8878 (cP)
 Scattering Intensity : 11397 (cps)



Volume Distribution

S/N : 123909

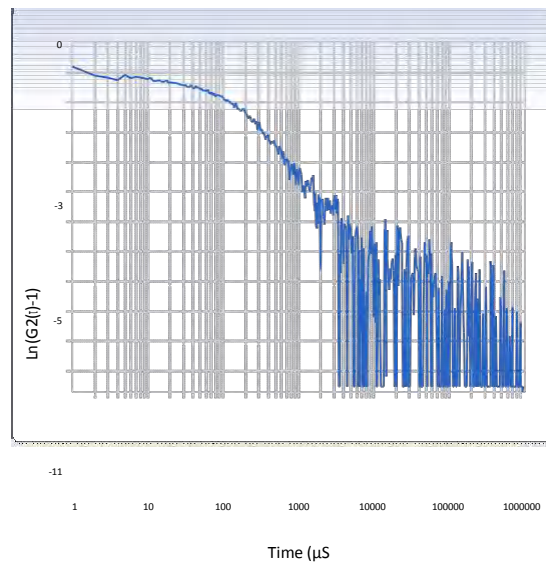
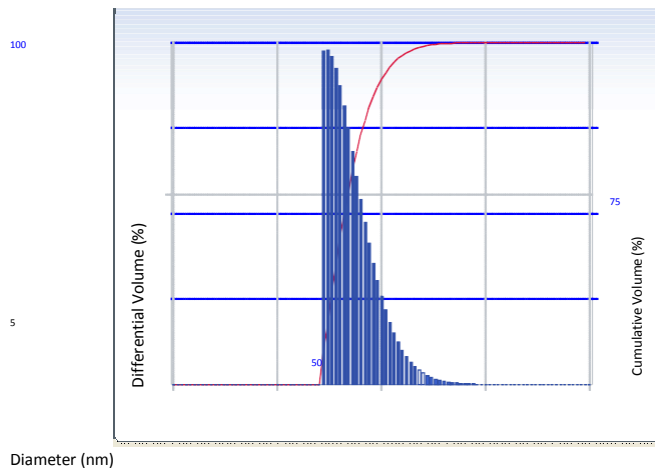
User : Common Group : Repetition : 1/1
 Date : 9/13/2018 File Name : NP-Ag A_20180913_140334
 Time : 14:03:34 Sample Information :

SOP Name : Sampel Uji PSA

Security : No Security

Version 2.31 / 2.03
 Volume Distribution

Ln(G2(τ)-1) vs τ



Distribution Results (Contin)

Peak	Diameter (nm)	Std. Dev.
1	29.5	19.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
Average	29.5	19.0
Residual :	9.183e-003	(O.K)

Cumulants Results

Measurement Condition		(nm)	
Temperature	: 25.0	(°C)	2/se
Diluent Name	: WATER		
Refractive Index	: 1.3328		c)
Viscosity	: 0.8878	(cP)	
Scattering Intensity	: 11397	(cps)	



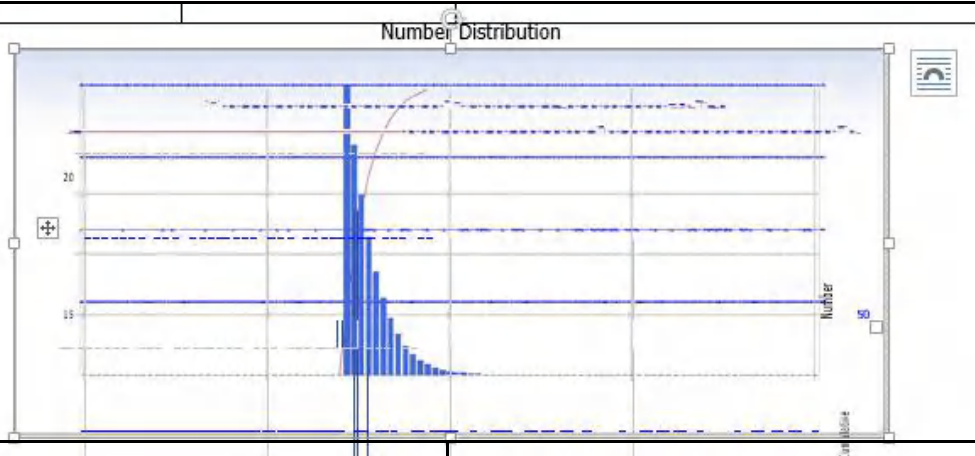
Number Distribution

S/N

: 123909

User	: Common	Group	:	Repetition	: 1/1
Date	: 9/13/2018	File Name	:	NP-Ag A_20180913_140334	
Time	: 14:03:34	Sample Information	:		
SOP Name	: Sampel Uji PSA	Security	:	No Security	

Version 2.31 / 2.03


Distribution Results (Contin)

Peak	Diameter (nm)	Std. Dev.
1	19.8	5.6
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
Average	19.8	5.6
Residual	: 9.183e-003	(O.K)

Cumulants Results

Diameter	(d) : 93.2	(nm)
Polydispersity Index (P.I.)	: 0.296	
Diffusion Const.	(D) : 5.281e-008	(cm ² /sec)
Measurement Condition		
Temperature	: 25.0	(°C)
Diluent Name	: WATER	
Refractive Index	: 1.3328	
Viscosity	: 0.8878	(cP)
Scattering Intensity	: 11397	(cps)

Number Distribution Table

d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)
0.0			6.7	0.0	0.0	45.3	0.3	99.5	304.7	0.0	100.0
0.0			7.3	0.0	0.0	48.9	0.2	99.7	328.9	0.0	100.0
0.0			7.8	0.0	0.0	52.7	0.1	99.8	354.9	0.0	100.0
0.0			8.5	0.0	0.0	56.9	0.1	99.9	383.1	0.0	100.0
0.0			9.1	0.0	0.0	61.4	0.0	99.9	413.4	0.0	100.0
0.0			9.9	0.0	0.0	66.3	0.0	99.9	446.2	0.0	100.0
0.0			10.6	0.0	0.0	71.6	0.0	100.0	481.5	0.0	100.0
0.0			11.5	0.0	0.0	77.2	0.0	100.0	519.7	0.0	100.0
0.0			12.4	0.0	0.0	83.3	0.0	100.0	560.9	0.0	100.0
0.0			13.4	0.0	0.0	90.0	0.0	100.0	605.3	0.0	100.0
2.0	0.0	0.0									



2.1	0.0	0.0	14.4	0.0	0.0	97.1	0.0	100.0	653.3	0.0	100.0
2.3	0.0	0.0	15.6	23.9	23.9	104.8	0.0	100.0	705.0	0.0	100.0
2.5	0.0	0.0	16.8	19.0	43.0	113.1	0.0	100.0	760.9	0.0	100.0
2.7	0.0	0.0	18.1	14.9	57.8	122.0	0.0	100.0	821.2	0.0	100.0
2.9	0.0	0.0	19.6	11.4	69.2	131.7	0.0	100.0	886.3	0.0	100.0
3.1	0.0	0.0	21.1	8.6	77.8	142.1	0.0	100.0	956.5	0.0	100.0
3.4	0.0	0.0	22.8	6.4	84.2	153.4	0.0	100.0	1032.3	0.0	100.0
3.7	0.0	0.0	24.6	4.7	88.8	165.6	0.0	100.0	1114.1	0.0	100.0
3.9	0.0	0.0	26.6	3.4	92.2	178.7	0.0	100.0	1202.4	0.0	100.0
4.3	0.0	0.0	28.7	2.4	94.6	192.8	0.0	100.0	1297.7	0.0	100.0

D (10%) : 14.9 (nm) D (50%) : 17.4 (nm) D (90%) : 25.3 (nm)

Number Distribution

d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)	d (nm)	f(%)	f(cum.%)
4.6	0.0	0.0	30.9	1.7	96.3	208.1	0.0	100.0	1400.5	0.0	100.0
5.0	0.0	0.0	33.4	1.2	97.5	224.6	0.0	100.0	1511.5	0.0	100.0
5.4	0.0	0.0	36.0	0.8	98.3	242.4	0.0	100.0	1631.2	0.0	100.0
5.8	0.0	0.0	38.9	0.6	98.9	261.6	0.0	100.0	1760.5	0.0	100.0
6.2	0.0	0.0	42.0	0.4	99.2	282.3	0.0	100.0	1900.0	0.0	100.0



Size Distribution Table

S/N : 123909

User : Common	Group :	Repetition : 1/1
Date : 9/13/2018	File Name : NP-Ag A_20180913_140334	
Time : 14:03:34	Sample Information :	
SOP Name : Sampel Uji PSA		Security : No Security

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Γ (1/sec)	d(nm)	f(%)Int.	f(cum.%)int.	f(%)Vol.	f(cum.%)Vol.	f(%)No.	f(cum.%)No.
311407.4	1.0	0.0	0.0	0.0	0.0	0.00	0.00
288542.8	1.1	0.0	0.0	0.0	0.0	0.00	0.00
267357.0	1.2	0.0	0.0	0.0	0.0	0.00	0.00
247726.7	1.3	0.0	0.0	0.0	0.0	0.00	0.00
229537.7	1.4	0.0	0.0	0.0	0.0	0.00	0.00
212684.3	1.5	0.0	0.0	0.0	0.0	0.00	0.00
197068.2	1.6	0.0	0.0	0.0	0.0	0.00	0.00
182598.8	1.7	0.0	0.0	0.0	0.0	0.00	0.00
169191.8	1.8	0.0	0.0	0.0	0.0	0.00	0.00
156769.1	2.0	0.0	0.0	0.0	0.0	0.00	0.00
145258.6	2.1	0.0	0.0	0.0	0.0	0.00	0.00
134593.2	2.3	0.0	0.0	0.0	0.0	0.00	0.00
124710.9	2.5	0.0	0.0	0.0	0.0	0.00	0.00
115554.2	2.7	0.0	0.0	0.0	0.0	0.00	0.00
107069.8	2.9	0.0	0.0	0.0	0.0	0.00	0.00
99208.3	3.1	0.0	0.0	0.0	0.0	0.00	0.00
91924.1	3.4	0.0	0.0	0.0	0.0	0.00	0.00
85174.7	3.7	0.0	0.0	0.0	0.0	0.00	0.00
78920.9	3.9	0.0	0.0	0.0	0.0	0.00	0.00
73126.2	4.3	0.0	0.0	0.0	0.0	0.00	0.00
67757.1	4.6	0.0	0.0	0.0	0.0	0.00	0.00
62782.1	5.0	0.0	0.0	0.0	0.0	0.00	0.00
58172.4	5.4	0.0	0.0	0.0	0.0	0.00	0.00
53901.2	5.8	0.0	0.0	0.0	0.0	0.00	0.00
49943.6	6.2	0.0	0.0	0.0	0.0	0.00	0.00
46276.5	6.7	0.0	0.0	0.0	0.0	0.00	0.00
42878.8	7.3	0.0	0.0	0.0	0.0	0.00	0.00
39730.5	7.8	0.0	0.0	0.0	0.0	0.00	0.00
36813.3	8.5	0.0	0.0	0.0	0.0	0.00	0.00
34110.3	9.1	0.0	0.0	0.0	0.0	0.00	0.00
31605.8	9.9	0.0	0.0	0.0	0.0	0.00	0.00
29285.2	10.6	0.0	0.0	0.0	0.0	0.00	0.00
27135.0	11.5	0.0	0.0	0.0	0.0	0.00	0.00
25142.7	12.4	0.0	0.0	0.0	0.0	0.00	0.00
23296.6	13.4	0.0	0.0	0.0	0.0	0.00	0.00
		0.0	0.0	0.0	0.0	0.00	0.00
		0.4	0.4	8.8	8.8	23.90	23.90
		0.5	0.8	8.8	17.6	19.05	42.95
		0.6	1.4	8.6	26.2	14.87	57.83
		0.7	2.1	8.3	34.5	11.40	69.22
		0.8	2.9	7.9	42.4	8.59	77.81
		1.0	3.9	7.3	49.8	6.37	84.18
		1.1	5.0	6.8	56.5	4.66	88.84



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11728.0	26.6	1.3	6.3	6.1	62.6	3.36	92.20
10866.9	28.7	1.4	7.7	5.5	68.1	2.40	94.60
10069.0	30.9	1.6	9.3	4.9	73.0	1.69	96.29
9329.7	33.4	1.8	11.1	4.3	77.3	1.18	97.48

Γ (1/sec)	d(nm)	f(%)Int.	f(cum.%)int.	f(%)Vol.	f(cum.%)Vol.	f(%)No.	f(cum.%)No.
8644.7	36.0	1.9	13.0	3.7	81.0	0.82	98.29
8010.0	38.9	2.1	15.1	3.2	84.2	0.56	98.86
7421.8	42.0	2.2	17.3	2.7	87.0	0.38	99.24
6876.9	45.3	2.4	19.7	2.3	89.3	0.26	99.50
6372.0	48.9	2.5	22.3	2.0	91.3	0.17	99.67
5904.1	52.7	2.7	24.9	1.6	92.9	0.11	99.78
5470.6	56.9	2.8	27.7	1.4	94.3	0.08	99.86
5068.9	61.4	2.9	30.6	1.1	95.4	0.05	99.91
4696.8	66.3	3.0	33.6	0.9	96.3	0.03	99.94
4351.9	71.6	3.1	36.7	0.8	97.1	0.02	99.96
4032.4	77.2	3.1	39.8	0.6	97.7	0.01	99.98
3736.3	83.3	3.2	42.9	0.5	98.2	0.01	99.99
3462.0	90.0	3.2	46.1	0.4	98.6	0.01	99.99
3207.8	97.1	3.2	49.3	0.3	98.9	0.00	99.99
2972.3	104.8	3.2	52.5	0.2	99.1	0.00	100.00
2754.0	113.1	3.2	55.6	0.2	99.3	0.00	100.00
2551.8	122.0	3.1	58.7	0.2	99.5	0.00	100.00
2364.5	131.7	3.1	61.8	0.1	99.6	0.00	100.00
2190.8	142.1	3.0	64.8	0.1	99.7	0.00	100.00
2030.0	153.4	2.9	67.7	0.1	99.8	0.00	100.00
1880.9	165.6	2.8	70.5	0.1	99.8	0.00	100.00
1742.8	178.7	2.7	73.2	0.0	99.9	0.00	100.00
1614.9	192.8	2.6	75.8	0.0	99.9	0.00	100.00
1496.3	208.1	2.5	78.2	0.0	99.9	0.00	100.00
1386.4	224.6	2.3	80.6	0.0	99.9	0.00	100.00
1284.6	242.4	2.2	82.8	0.0	100.0	0.00	100.00
1190.3	261.6	2.1	84.8	0.0	100.0	0.00	100.00
1102.9	282.3	1.9	86.7	0.0	100.0	0.00	100.00
1021.9	304.7	1.8	88.5	0.0	100.0	0.00	100.00
946.9	328.9	1.6	90.2	0.0	100.0	0.00	100.00
877.4	354.9	1.5	91.7	0.0	100.0	0.00	100.00
813.0	383.1	1.4	93.0	0.0	100.0	0.00	100.00
753.3	413.4	1.2	94.2	0.0	100.0	0.00	100.00
698.0	446.2	1.1	95.4	0.0	100.0	0.00	100.00
646.7	481.5	1.0	96.3	0.0	100.0	0.00	100.00
599.2	519.7	0.9	97.2	0.0	100.0	0.00	100.00
555.2	560.9	0.8	97.9	0.0	100.0	0.00	100.00
514.5	605.3	0.6	98.6	0.0	100.0	0.00	100.00
476.7	653.3	0.6	99.1	0.0	100.0	0.00	100.00
441.7	705.0	0.5	99.6	0.0	100.0	0.00	100.00
409.3	760.9	0.4	100.0	0.0	100.0	0.00	100.00
379.2	821.2	0.0	100.0	0.0	100.0	0.00	100.00
351.4	886.3	0.0	100.0	0.0	100.0	0.00	100.00
325.6	956.5	0.0	100.0	0.0	100.0	0.00	100.00
301.7	1032.3	0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00
		0.0	100.0	0.0	100.0	0.00	100.00



Cumulative Size Distribution Table

S/N : 123909

User : Common	Group :	Repetition : 1/1
Date : 9/13/2018	File Name : NP-Ag A_20180913_140334	
Time : 14:03:34	Sample Information :	
SOP Name : Sampel Uji PSA		Security : No Security

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Cum. %	d (nm) Int. Dist.	d (nm) Vol. Dist.	d (nm) No. Dist.
5	24.6	15.1	14.7
10	31.9	15.7	14.9
15	38.8	16.4	15.1
20	45.7	17.2	15.4
25	52.8	17.9	15.6
30	60.4	18.8	16.0
35	68.7	19.7	16.3
40	77.7	20.6	16.6
45	87.6	21.7	17.0
50	98.7	22.9	17.4
55	111.4	24.2	17.9
60	125.9	25.7	18.4
65	143.0	27.4	19.0
70	163.4	29.5	19.7
75	188.5	32.0	20.6
80	220.5	35.3	21.7
85	263.5	39.7	23.1
90	326.5	46.5	25.3
95	435.5	59.8	29.2
100	760.9	760.9	261.6



Lampiran 9. Data Hasil Karakterisasi Nanopartikel Perak Menggunakan XRD

*** Basic Data Process ***

Group : Standard
Data : N#Ag#A

Strongest 3 peaks

no. peak	2Theta (deg)	d (Å)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated (Counts)	Int
1	5	44.0621	2.05354	100	0.17690	2296	22095
2	10	77.5417	1.23010	71	0.22610	1631	21201
3	2	37.8241	2.37662	67	0.17450	1534	15175

Peak Data List

peak no.	2Theta (deg)	d (Å)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated (Counts)	Int
1	33.9788	2.63626	15	0.15110	341	2990	
2	37.8241	2.37662	67	0.17450	1534	15175	
3	39.5392	2.27739	26	0.14770	589	4994	
4	43.7600	2.06701	5	0.11660	120	1203	
5	44.0621	2.05354	100	0.17690	2296	22095	
6	57.5047	1.60137	15	0.16520	333	3433	
7	64.4279	1.44499	55	0.19410	1262	14468	
8	68.8240	1.36303	18	0.19060	415	4328	
9	69.2459	1.35575	4	0.12310	91	548	
10	77.5417	1.23010	71	0.22610	1631	21201	
11	77.9200	1.22508	3	0.11140	76	1144	



*** Basic Data Process ***

Data Infomation

Group : Standard
Data : N#Ag#A
Sample Nmae : serbuk
Comment :
Date & Time : 08-30-18 11:02:08

Measurement Condition

X-ray tube

target: Cu
Voltage : 40.0 (kV)
current : 30.0 (mA)

Slits

Auto Slit : Used
divergence slit : 1.00000 (deg)
scatter slit : 1.00000 (deg)
receiving slit : 0.30000 (mm)

Scanning

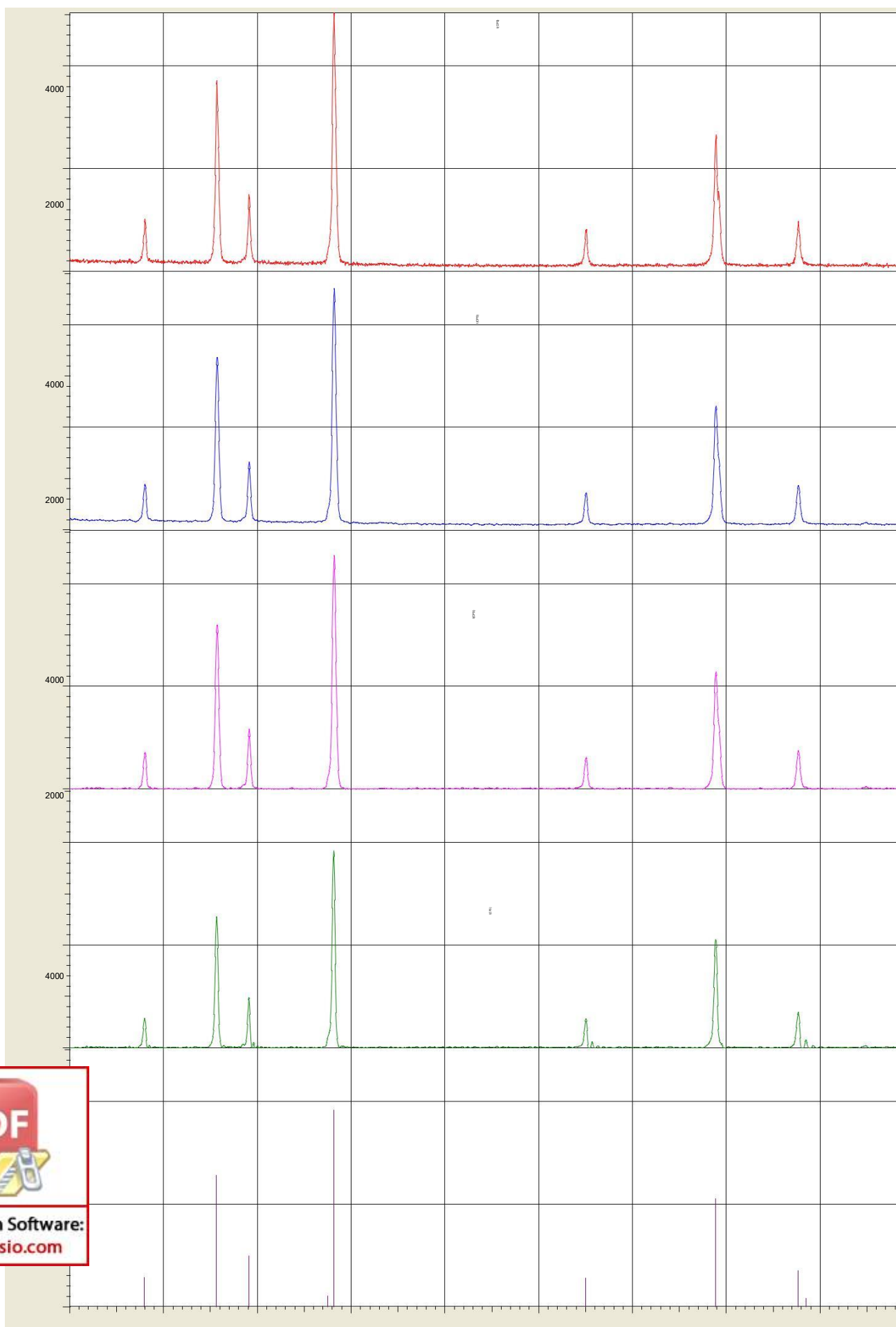
drive axis : Theta-2Theta
scan range : 30.0000 - 80.0000 (deg)
scan mode : Continuous Scan
scan speed : 2.0000 (deg/min)
sampling pitch : 0.0200 (deg)
preset time : 0.60 (sec)

Data Process Condition

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

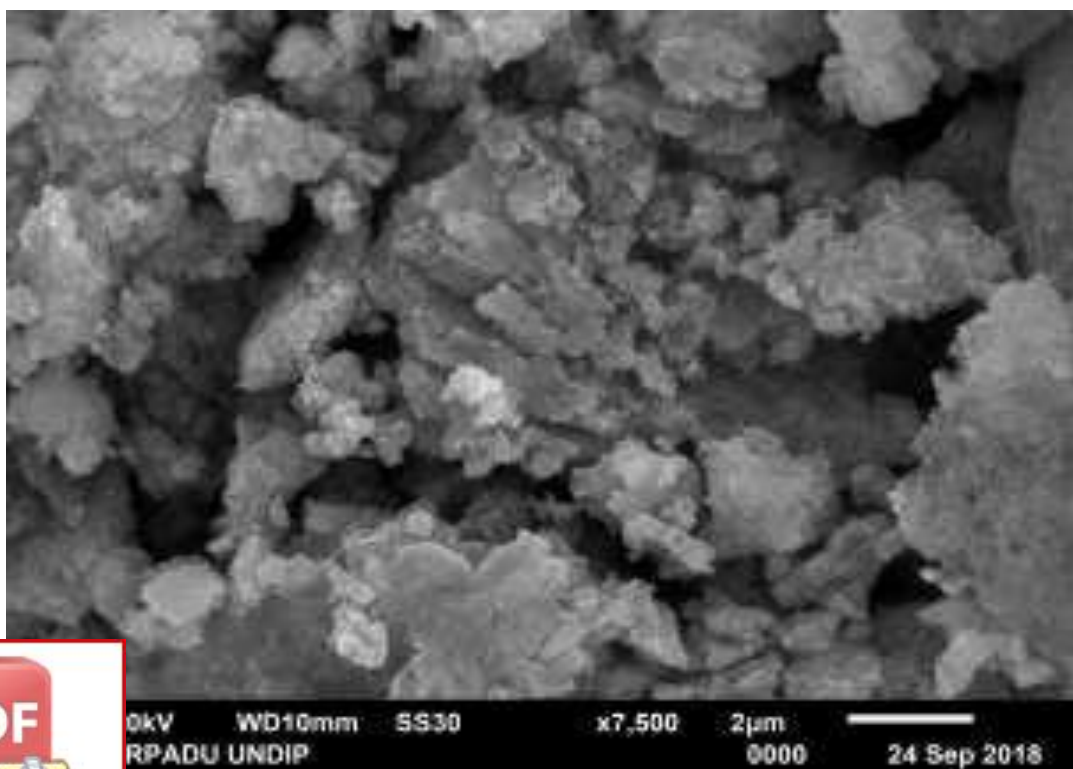
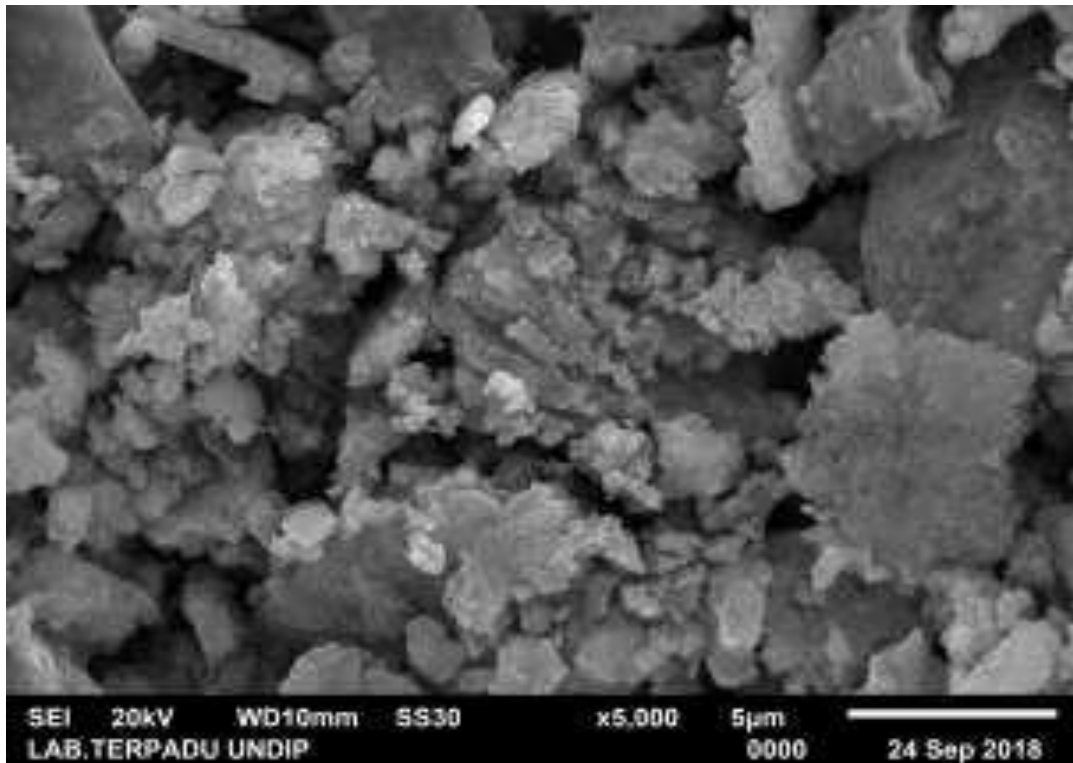


< Group: Standard Data: N#Ag#A >

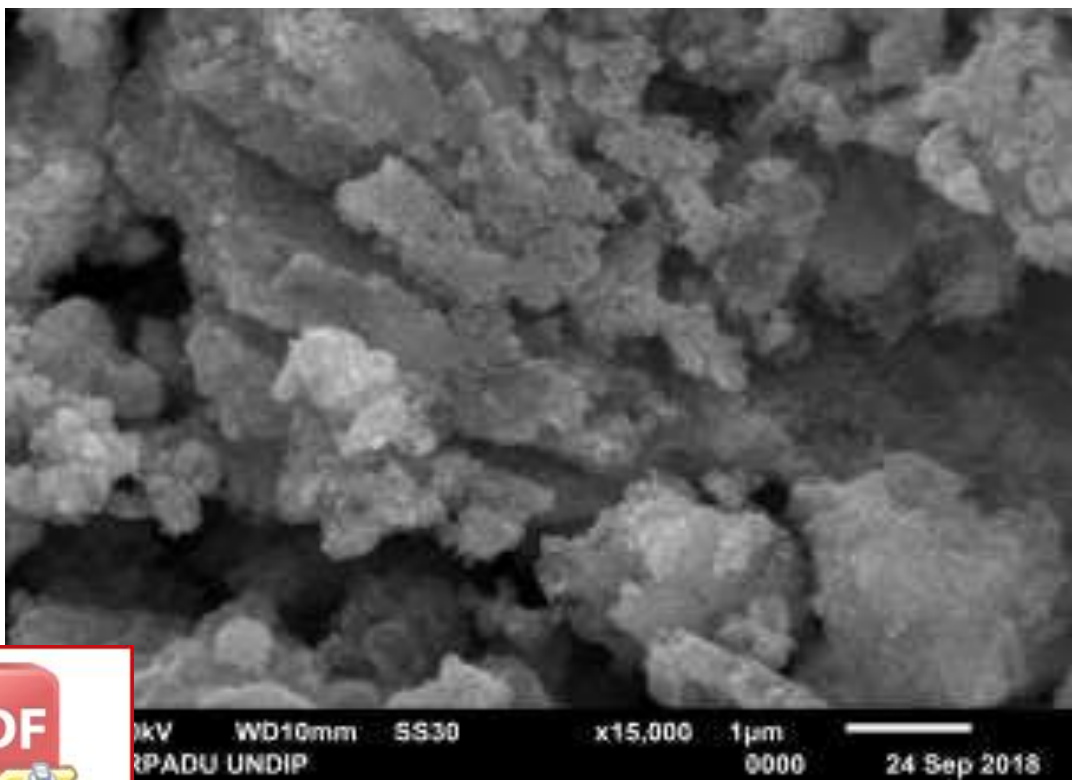
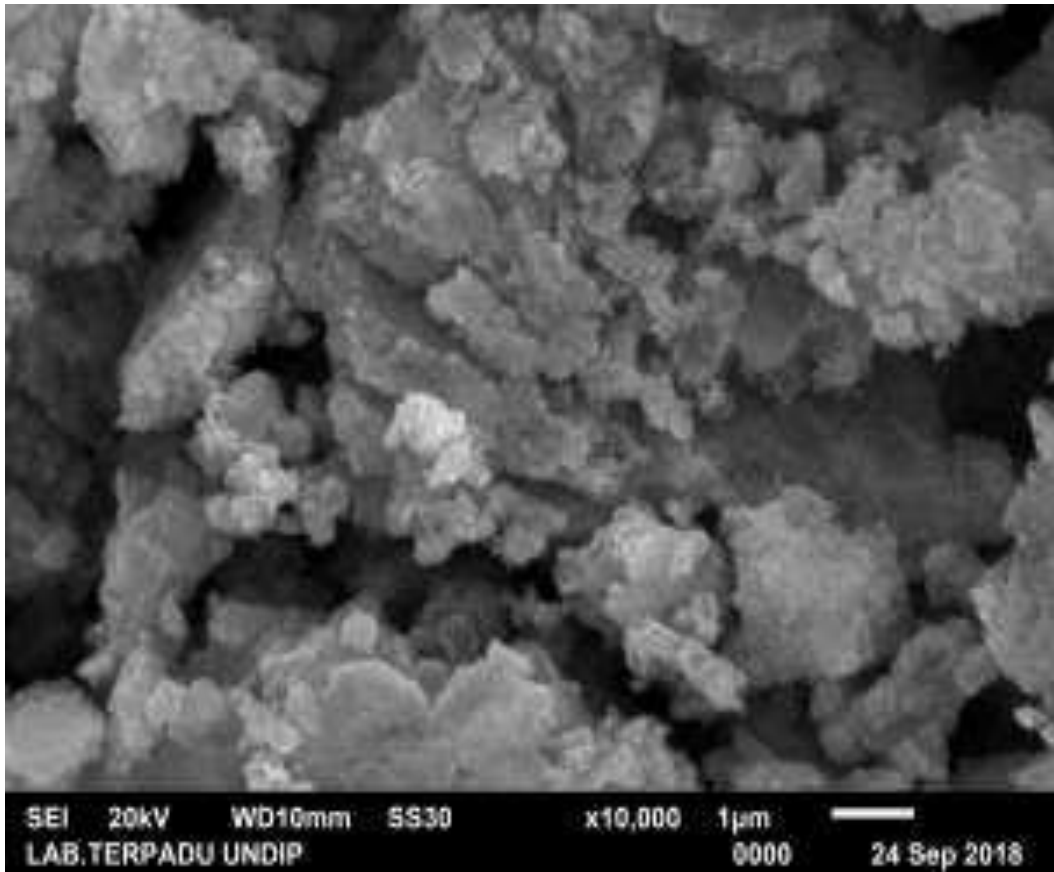


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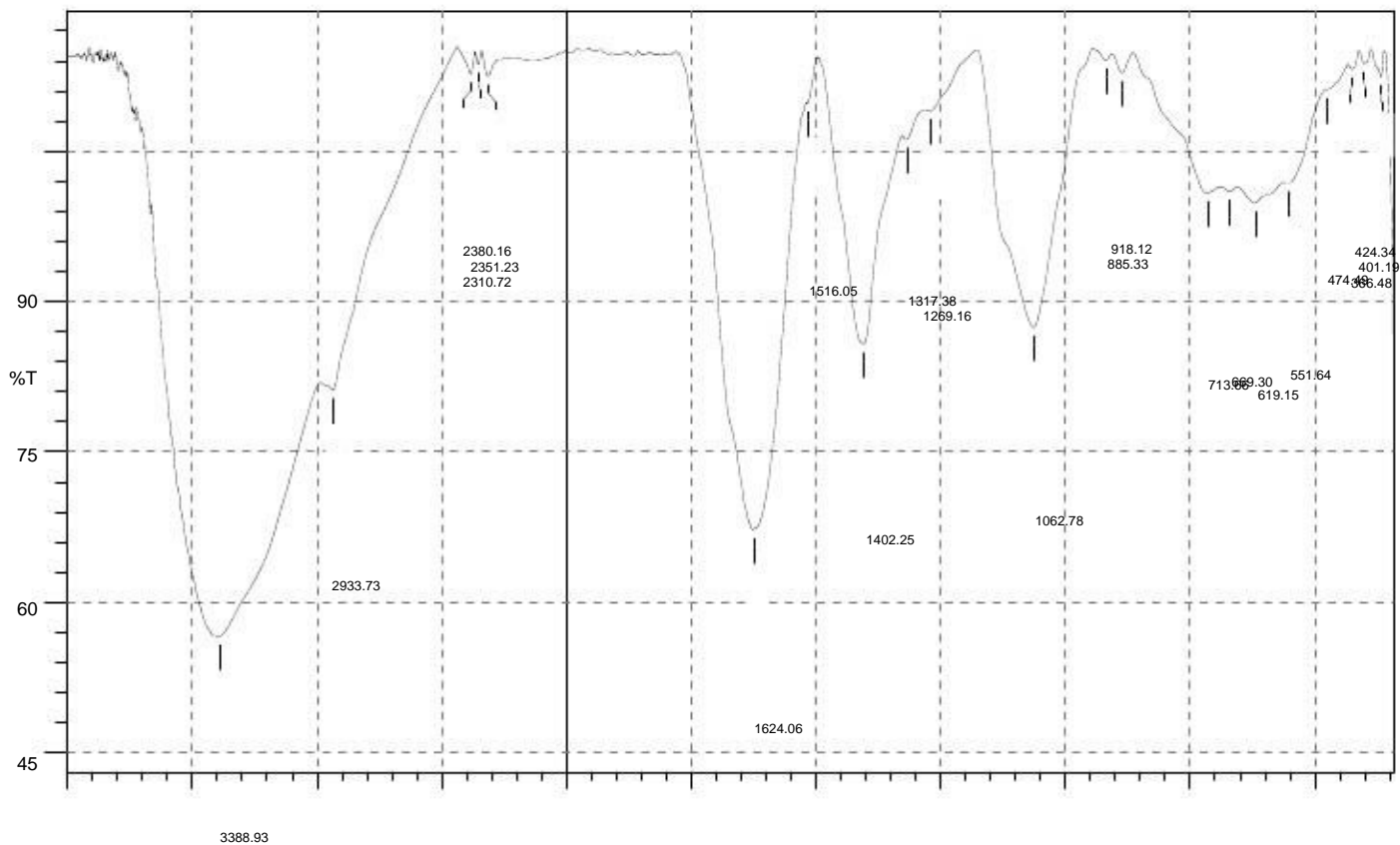
Lampiran 10. Data Hasil Karakterisasi SEM



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Optimization Software:
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3388.93

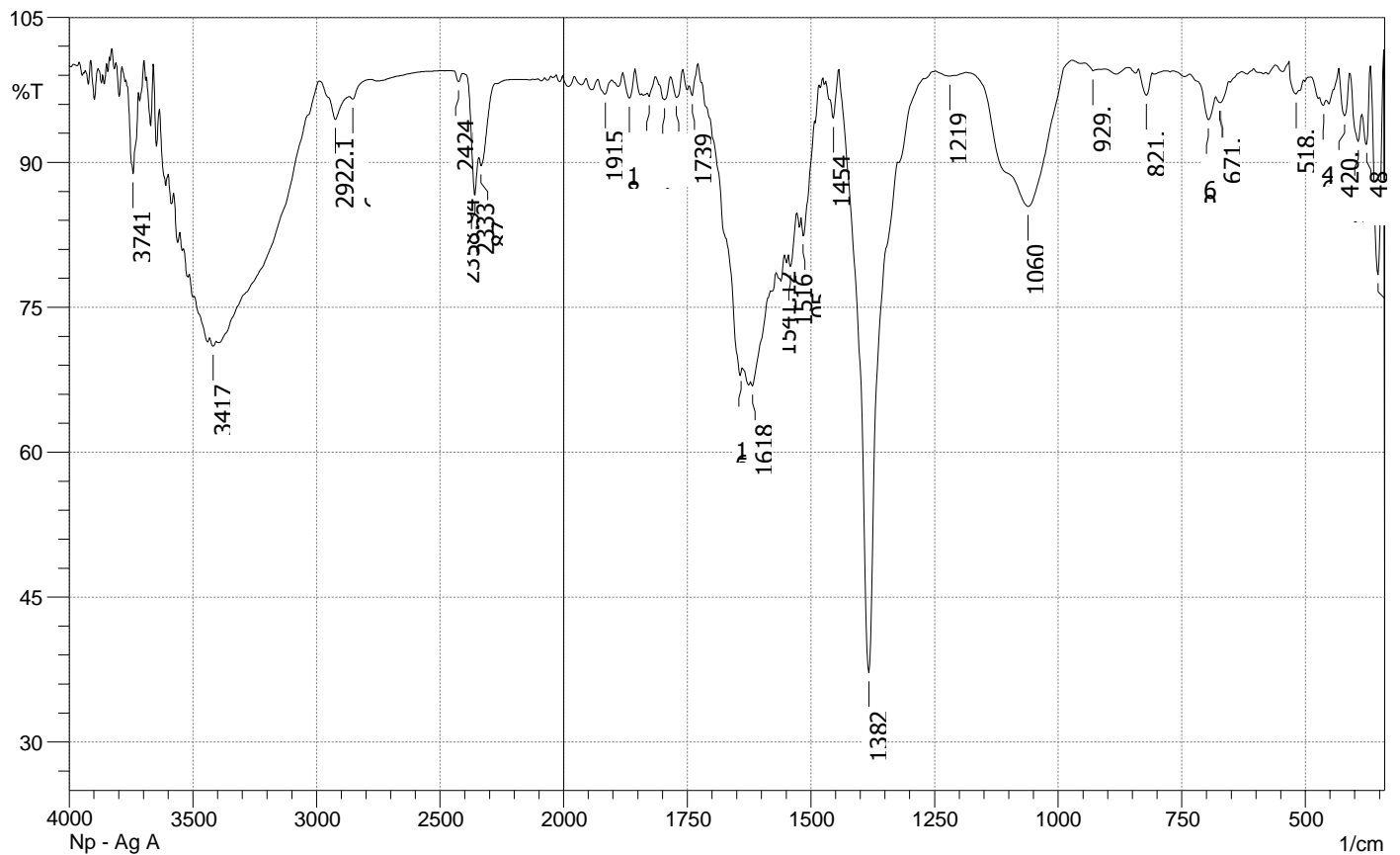
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	366.48	97.352	1.781	372.26	360.69	0.099	0.055
2	401.19	98.671	1.334	410.84	385.76	0.08	0.082
3	424.34	98.133	0.965	432.05	410.84	0.134	0.067
4	474.49	96.038	0.128	476.42	432.05	0.581	0.069
5	551.64	86.753	0.936	559.36	478.35	3.445	0.326
6	619.15	84.745	1.784	653.87	561.29	6.224	0.435
7	669.3	85.895	0.458	684.73	655.8	1.88	0.037
8	713.66	85.784	2.648	862.18	686.66	6.71	0.967
9	885.33	97.754	1.927	904.61	864.11	0.233	0.178
10	918.12	98.989	0.8	937.4	904.61	0.08	0.055
11	1062.78	72.371	27.72	1174.65	945.12	16.405	16.497
12	1269.16	93.966	0.26	1273.02	1176.58	1.243	0.057
13	1317.38	91.089	0.845	1325.1	1282.66	1.435	0.068
14	1402.25	70.684	24.317	1492.9	1327.03	13.366	9.853
15	1516.05	94.686	0.508	1517.98	1496.76	0.319	0.041
16	1624.06	52.14	1.375	1778.37	1620.21	20.673	0.699
17	2310.72	97.401	2.239	2337.72	2264.43	0.489	0.338
18	2351.23	98.579	1.32	2362.8	2337.72	0.091	0.081
19	2380.16	97.632	2.342	2434.17	2362.8	0.327	0.359
20	2933.73	66.119	1.679	2953.02	2436.09	37.916	0.291
21	3388.93	41.542	0.37	3394.72	2983.88	118.008	4.251



Date/Time; 6/7/2018 2:10:47 PM
No. of Scans;

Resolution;
Apodization;

Lampiran 12. Data Hasil Karakterisasi Nanopartikel Perak Menggunakan FTIR



	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	78.373	21.292	368.4	343.33	1.5	1.468
2	376.12	91.861	5.892	385.76	368.4	0.436	0.24
3	393.48	92.156	4.136	410.84	385.76	0.587	0.265
4	420.48	94.824	4.65	432.05	410.84	0.328	0.282
5	462.92	95.884	0.625	470.63	459.06	0.197	0.021
6	518.85	97.086	1.274	532.35	513.07	0.197	0.108
7	671.23	96.177	1.192	680.87	653.87	0.373	0.087
8	696.3	94.417	2.896	732.95	682.8	0.693	0.217
9	821.68	96.946	2.49	837.11	810.1	0.235	0.173
10	929.69	99.468	0.563	947.05	904.61	0.044	0.039
11	1060.85	85.441	14.595	1184.29	972.12	7.037	6.979
12	1219.01	98.934	0.157	1247.94	1211.3	0.144	0.019
13	1382.96	37.17	57.577	1442.75	1325.1	16.795	13.972
14	1454.33	94.557	4.548	1469.76	1442.75	0.382	0.266
15	1516.05	82.389	3.365	1519.91	1485.19	1.734	0.333
16	1541.12	79.21	2.293	1544.98	1529.55	1.391	0.126
17	1618.28	66.861	1.353	1622.13	1581.63	5.884	0.147
18	1641.42	68.259	1.172	1728.22	1639.49	6.332	0.136
19	1739.79	96.896	1.797	1745.58	1728.22	0.132	0.061
20	1772.58	96.719	2.506	1784.15	1759.08	0.239	0.157
21	1795.73	96.48	2.399	1815.02	1784.15	0.325	0.174
22	1826.59	96.824	0.767	1830.45	1815.02	0.163	0.029
23	1867.09	96.655	2.844	1880.6	1855.52	0.239	0.182
24	1915.31	97.07	1.477	1930.74	1903.74	0.27	0.099
25	2333.87	89.625	1.768	2341.58	2276	1.782	0.215
26	2358.94	86.631	5.992	2407.16	2343.51	1.878	0.53
27	2424.52	98.35	0.956	2457.31	2407.16	0.209	0.067
28	2852.72	96.551	0.56	2866.22	2787.14	0.784	0.043
29	2922.16	94.463	3.08	2985.81	2868.15	1.913	0.668
30	3417.86	70.97	0.675	3431.36	3406.29	3.695	0.063
31	3741.06	70.97	8.974	3770.84	3720.69	1.537	1.064



Lampiran 13. Dokumentasi



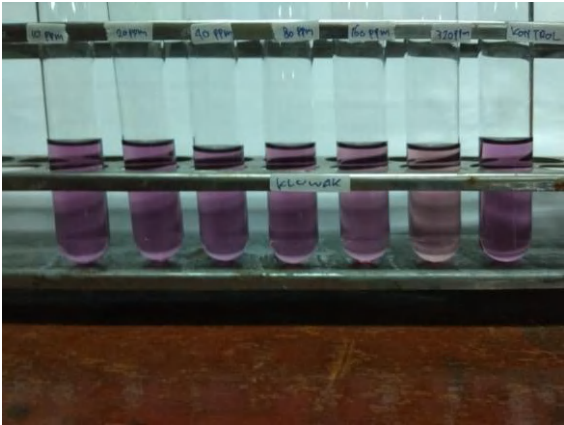
Sampel



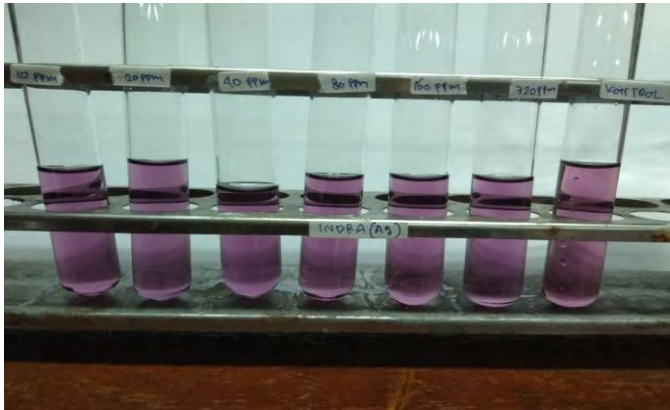
Menimbang AgNO₃



Nanopartikel Perak



Uji Antioksidan Ekstrak Daun Kluwak



Optimization Software:
www.balesio.com

Uji Antioksidan Nanopartikel Perak



Spektrofotometer UV-Vis

FTIR



XRD

SEM



PSA



Lampiran 14. Perkiraan Mekanisme Reaksi Sintesis Nanopartikel Perak Dengan Menggunakan Ekstrak Daun Kluwak (Pangium Edule Reinw)

