BAB V
KESIMPULAN DAN SARAN

A. Kesimpulan

Berdasarkan penelitian yang telah dilakukan maka dapat disimpulkan bahwa:

1. Variasi konsentrasi carbopol 940 yang digunakan sebagai *gelling agent* berpengaruh pada mutu fisik NLC resveratrol berbasis gel.
2. Studi deskriptif sediaan topikal dengan variasi konsentrasi carbopol 940 menghasilkan pelepasan obat yang baik pada konsentrasi carbopol 940 yang terendah.
3. Studi deskriptif sediaan topikal dengan variasi konsentrasi carbopol 940 menghasilkan aktivitas antioksidan yang baik pada konsentrasi carbopol 940 yang terendah.

B. Saran

Berdasarkan hasil penelitian yang telah dilakukan, penulis menyarankan perlu dilakukan penelitian lebih lanjut mengenai NLC resveratrol berbasis gel ini agar hasil yang diperoleh bisa lebih maksimal lagi, yaitu:

1. Dapat dilakukan pengujian pelepasan obat dan aktivitas antioksidan NLC resveratrol berbasis gel.
2. Dapat dilakukan uji optimasi NLC resveratrol berbasis gel.

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L A M P I R A N

Lampiran 1. Certificate Of Analysis (COA)

1. COA resveratrol

泽世化学 THANEN CHEMICALS
THANEN CHEMICALS(CHANGZHOU)CO.,LTD
ADDRESS: RM2705, BLDG 5, CHANGFA, 101-1# TAIHU ROAD, 213022, P.R.CHINA
TEL: +86 519 89880626 FAX: +86-519-89880629

Certificate Of Analysis

Product name: Resveratrol

Batch NO.: 200101H — Producing date: 2019.12.29

CAS NO.:501-36-0 — Analysis date: 2020.01.08

Quantity: 10G — Retest date : 2020.12.28

Item	Specification	Result
Description	White or almost white	Passed
Clarity of Solution	The solution should be	Passed
Identification	IR	Passed
LOD	NMT0.3%	0.15%
ROI	NMT0.1%	0.04%
Melting point	252-262℃	257.3-259.2℃
Single impurity	NMT0.1%	0.07%
Purity	99.0%up	99.88%

Conclusion: It is up to the enterprise standard.

For and on behalf of 常州泽世化学有限公司 THANEN CHEMICALS(CHANGZHOU)CO.,LTD
Authorized Signature(s)

Date 2016-03-09 (YYYY-MM-DD) Time 20:41:28 (Greenwich Mean Time) Page 2 of 2

DOW CHEMICAL PACIFIC LIMITED

COLORCON SHANGHAI TRADING
COMPANY LIMITED
NO. 588, CHUNDONG ROAD,
201108 SHANGHAI
CHINA
Ship From: BAY CITY Whse
BAY CITY
Michigan, United States

be NMT 20 ppm heavy metals (as Pb) and also meets all specification requirements for harmonized identification tests, residual solvents and microbiological limits.

Shari Workentine

Shari Workentine
Dow Pharma & Food Solutions Quality System Specialist

For inquiries please contact Customer Service or local sales
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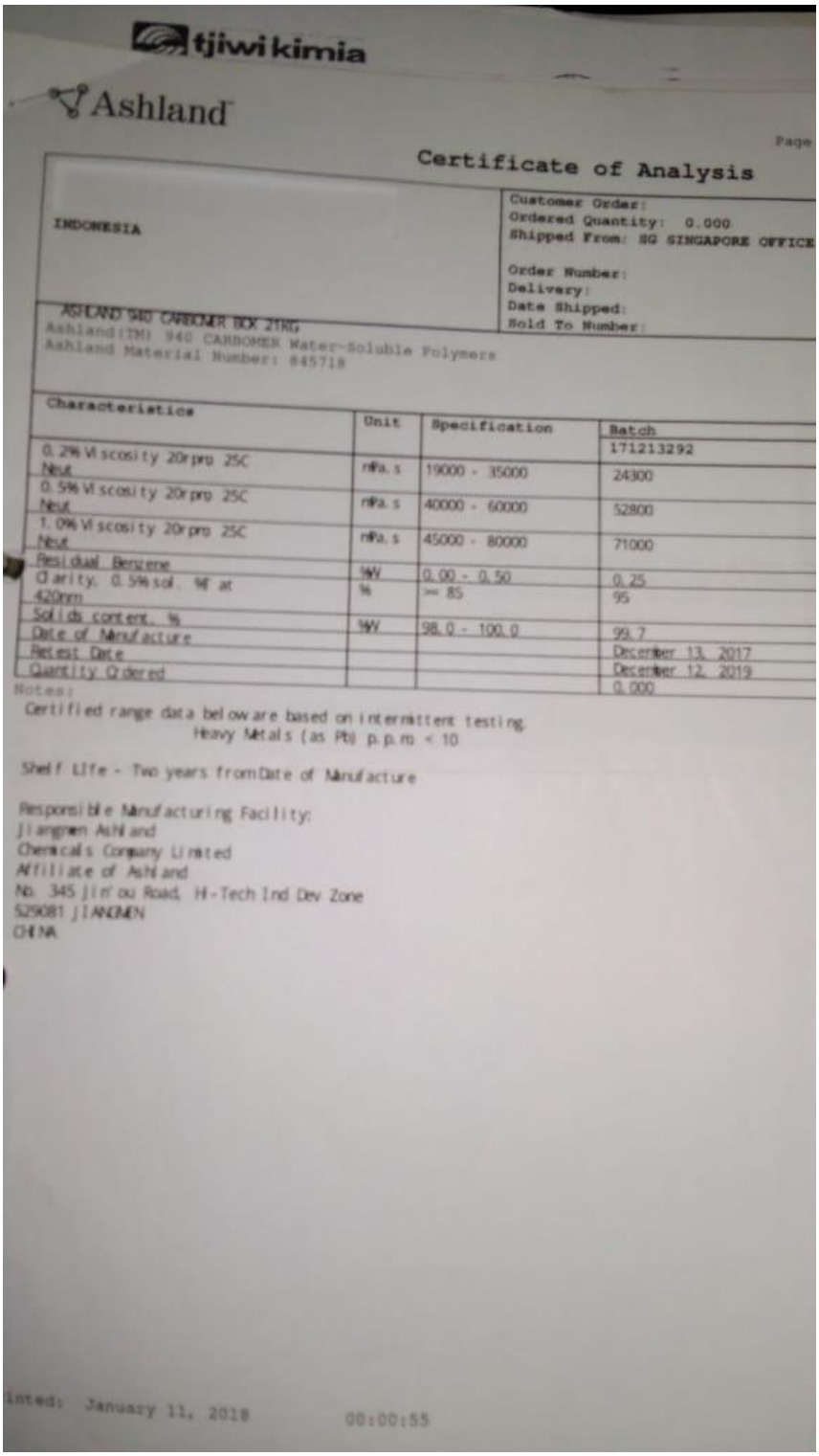
2. COA carbopol 940



tjiwi kimia

Ashland

Page

Certificate of Analysis

INDONESIA

Customer Order:
Ordered Quantity: 0.000
Shipped From: SG SINGAPORE OFFICE
Order Number:
Delivery:
Date Shipped:
Sold To Number:

ASHLAND 940 CARBOMER BOX 21KG
Ashland(TM) 940 CARBOMER Water-Soluble Polymers
Ashland Material Number: 845718

Characteristics	Unit	Specification	Batch
			171213292
0.2% Viscosity 20rpm 25C Neut	mPa.s	19000 - 35000	24800
0.5% Viscosity 20rpm 25C Neut	mPa.s	40000 - 60000	52800
1.0% Viscosity 20rpm 25C Neut	mPa.s	45000 - 80000	71000
Residual Benzene	%W	0.00 - 0.50	0.25
Clarity, 0.5% sol. %T at 420nm	%	>= 85	95
Solids content, %	%W	98.0 - 100.0	99.7
Date of Manufacture			December 13, 2017
Retest Date			December 12, 2019
Quantity Ordered			0.000

Notes:
Certified range data below are based on intermittent testing.
Heavy Metals (as Pb) p.p.m. < 10

Shelf Life - Two years from Date of Manufacture

Responsible Manufacturing Facility:
Jiangmen Ashland
Chemicals Company Limited
Affiliate of Ashland
No. 345 Jin'ou Road, Hi-Tech Ind Dev Zone
529081 JIANGMEN
CHINA

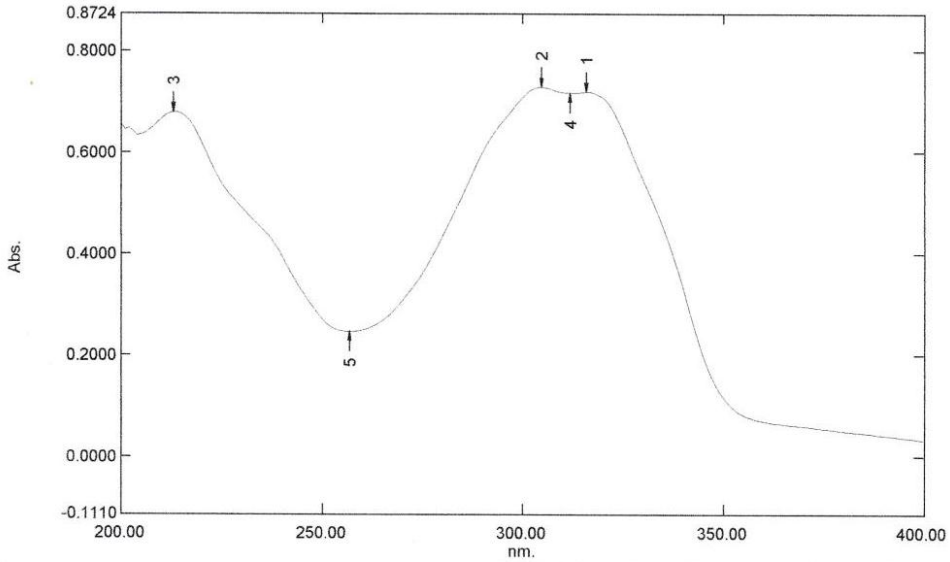
inted: January 11, 2018 00:00:55

Lampiran 2. Panjang gelombang resveratrol dalam medium dapar fosfat *p*H 7,4

Spectrum Peak Pick Report

03/09/2020 03:11:22 PM

Data Set: File_200309_151002 - RawData



[Measurement Properties]
Wavelength Range (nm.): 200.00 to 400.00
Scan Speed: Medium
Sampling Interval: 1.0
Auto Sampling Interval: Disabled
Scan Mode: Single

[Instrument Properties]
Instrument Type: UV-1800 Series
Measuring Mode: Absorbance
Slit Width: 1.0 nm
Light Source Change Wavelength: 340.0 nm
S/R Exchange: Normal

[Attachment Properties]
Attachment: None

[Operation]
Threshold: 0.0010000
Points: 4
InterPolate: Disabled
Average: Disabled

[Sample Preparation Properties]
Weight:
Volume:
Dilution:
Path Length:
Additional Information:

No.	P/V	Wavelength	Abs.	Description
1	↑	316.00	0.7189	
2	↑	305.00	0.7281	
3	↑	213.00	0.6794	
4	↓	312.00	0.7169	
5	↓	257.00	0.2463	

Lampiran 3. Panjang gelombang resveratrol dalam medium methanol

Spectrum Peak Pick Report

03/11/2020 07:52:50 AM

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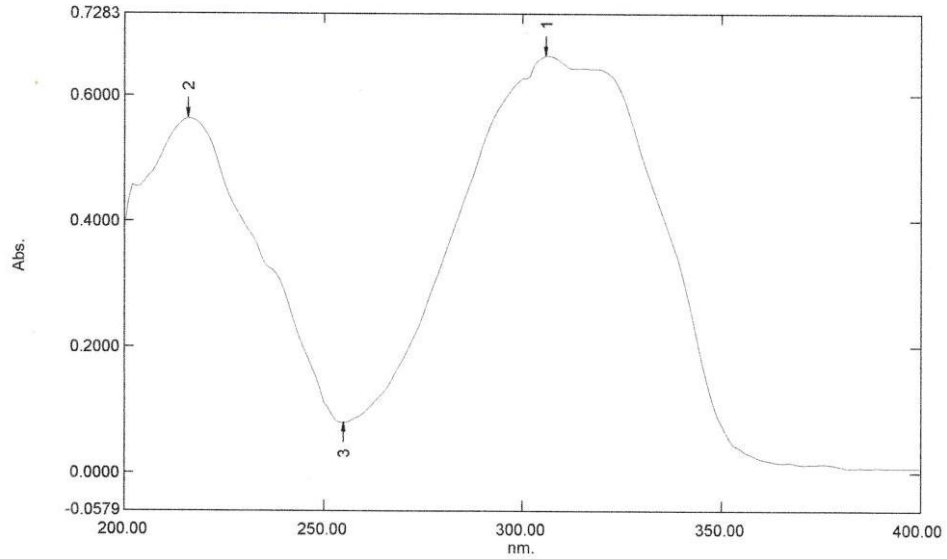


[Measurement Properties]

Wavelength Range (nm.):	200.00 to 400.00
Scan Speed:	Medium
Sampling Interval:	1.0
Auto Sampling Interval:	Disabled
Scan Mode:	Single

[Instrument Properties]

Instrument Type:	UV-1800 Series
Measuring Mode:	Absorbance
Slit Width:	1.0 nm
Light Source Change Wavelength:	340.0 nm
S/R Exchange:	Normal

[Attachment Properties]

Attachment:	None

[Operation]

Threshold:	0.0010000
Points:	4
InterPolate:	Disabled
Average:	Disabled

[Sample Preparation Properties]

Weight:	
Volume:	
Dilution:	
Path Length:	
Additional Information:	

No.	P/V	Wavelength	Abs.	Description
1	↑	306.00	0.6628	
2	↑	216.00	0.5632	
3	↓	255.00	0.0802	

Lampiran 4. Kurva kalibrasi dan verifikasi metode analisis

1. Kurva kalibrasi resveratrol dalam metanol

a. Hasil kurva kalibrasi

1) Perhitungan larutan induk resveratrol

Berat penimbangan = 0,049 gram = 49 mg

$$\frac{49 \text{ mg}}{10 \text{ mL}} = \frac{490 \text{ mg}}{1000 \text{ mL}} = 4900 \text{ ppm}$$

2) Pembuatan larutan stok resveratrol

$V_1 \times C_1 = V_2 \times C_2$

$V_1 \times 4900 \text{ ppm} = 10000 \text{ µL} \times 98 \text{ ppm}$

$V_1 = 200 \text{ µL}$

3) Penentuan panjang gelombang maksimum

$V_1 \times C_1 = V_2 \times C_2$

$V_1 \times 98 \text{ ppm} = 10000 \text{ µL} \times 9{,}8 \text{ ppm}$

$V_1 = 1000 \text{ µL}$

Panjang gelombang maksimum:

Wavelength	Abs
306.00	0.6628

b. Hasil verifikasi metode analisis

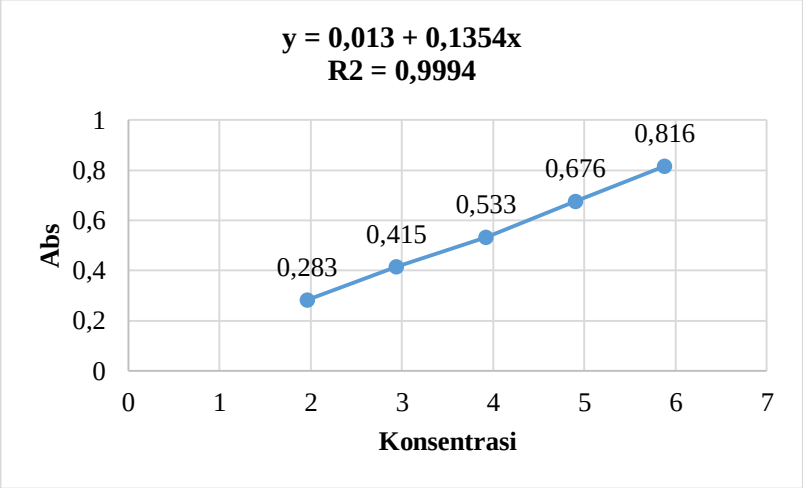
1) Linearitas

Larutan baku resveratrol 98 ppm dibuat 5 seri pengenceran yaitu 1,96 ppm; 2,94 ppm; 3,92 ppm; 4,9 ppm; dan 5,88 ppm.

Konsentrasi (ppm)	Vol. yang diambil (µL)	Vol. yang dibuat (µL)
1,96	200	10000
2,94	300	10000
3,92	400	10000
4,9	500	10000
5,88	600	10000

Perhitungan kurva baku resveratrol dalam metanol

1,96 ppm = V_1 x 98 ppm = 10000 µL x 1,96 ppm = 200 µL
2,94 ppm = V_1 x 98 ppm = 10000 µL x 2,94 ppm = 300 µL
3,92 ppm = V_1 x 98 ppm = 10000 µL x 3,92 ppm = 400 µL
4,9 ppm = V_1 x 98 ppm = 10000 µL x 4,9 ppm = 500 µL
5,88 ppm = V_1 x 98 ppm = 10000 µL x 5,88 ppm = 600 µL



Nilai linieritas pada kurva kalibrasi resveratrol dalam metanol yaitu:

Intercept (a) = 0.0138

Slope (b) = 0.1354082

Koefisien korelasi (r) = 0.9994431

2) Akurasi

Konsentrasi	Replikasi	Abs	Konsentrasi	Sebenarnya	%		Rata-rata
80%	1	0.411	2.933353429	2.94	99.77%	99.94%	
	2	0.411	2.933353429	2.94	99.77%		
	3	0.413	2.948123587	2.94	100.28%		
100%	1	0.503	3.612780708	3.92	92.16%	101.33%	100.34%
	2	0.574	4.137121326	3.92	105.54%		
	3	0.578	4.166661643	3.92	106.29%		
120%	1	0.655	4.735312735	4.9	96.64%	99.75%	
	2	0.682	4.934709872	4.9	100.71%		
	3	0.69	4.993790505	4.9	101.91%		

3) Presisi

Konsentrasi (ppm)	Abs	Konsentrasi
3.92	0.562	4.0485
3.92	0.544	3.9156
3.92	0.552	3.9746
3.92	0.503	3.6128
3.92	0.532	3.8269
3.92	0.506	3.6349
3.92	0.512	3.6792
3.92	0.532	3.8269
3.92	0.508	3.6497
	Rata-rata	3.7966
	SD	0.160634
	CV	0.04231

Perhitungan % RSD = $\frac{S}{X}$ X 100%

$$= \frac{0.160634}{3.7966} \; X \; 100\% = 0{,}04231\%$$

4) LOD & LOQ

5) X (ppm)	Y (abs)	y'	y-y'	(y-y')2
1.96	0.283	0.2792	0.0038	1.444E-05
2.94	0.415	0.4119	0.0031	9.61E-06
3.92	0.533	0.5446	-0.0116	0.00013456
4.9	0.676	0.6773	-0.0013	1.69E-06
5.88	0.816	0.81	0.006	3.6E-05

Jumlah = 0.0001963

Sy/x = 0.007005355

LOD = $\frac{3 \text{ sy/x}}{\text{b}}$ LOQ= $\frac{10 \text{ sy/x}}{\text{b}}$

LOD = $\frac{3.3 \text{ x } 0.007005355}{0.135408}$ = 0.170725836

LOQ = $\frac{10 \text{ x } 0.007005355}{0.135408}$ = 0.517351017

2. Kurva kalibrasi resveratrol dalam dapar fosfat *p*H 7,4

a. Hasil kurva kalibrasi resveratrol

1) Perhitungan larutan induk resveratrol

Berat penimbangan = 0,049 gram = 49 mg

$\frac{49 \text{ mg}}{10 \text{ mL}} = \frac{490 \text{ mg}}{1000 \text{ mL}}$ = 4900 ppm

2) Perhitungan larutan stok resveratrol

V_1 x C_1 = V_2 x C_2

V_1 x 4900 ppm = 10000 µL x 98 ppm

V_1 = 200 µL

3) Penentuan panjang gelombang maksimum

V_1 x C_1 = V_2 x C_2

V_1 x 98 ppm = 10000 µL x 4,9 ppm

V_1 = 500 µL

Panjang gelombang maksimum:

Wavelength	Abs
317.00	0.7189

b. Hasil verifikasi metode analisis

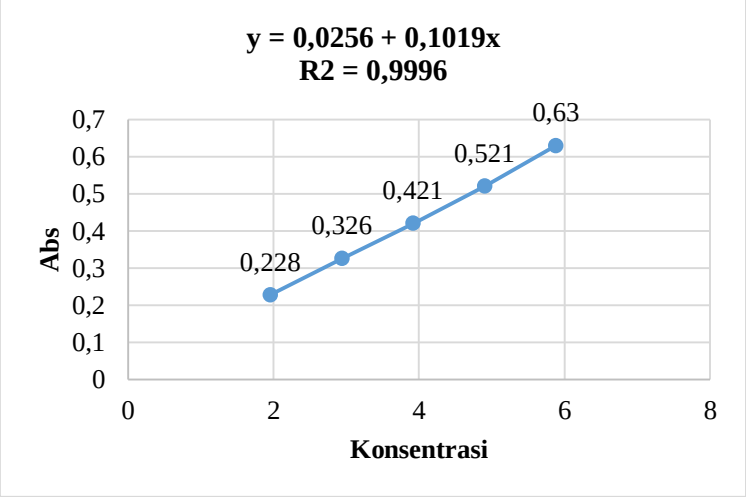
1) Linearitas

Larutan baku resveratrol 98 ppm dibuat 5 seri pengenceran yaitu 1,96 ppm; 2,94 ppm; 3,92 ppm; 4,9 ppm; dan 5,88 ppm.

Konsentrasi (ppm)	Vol. yang diambil (µL)	Vol. yang dibuat (µL)
1,96	200	10000
2,94	300	10000
3,92	400	10000
4,9	500	10000
5,88	600	10000

Perhitungan kurva baku resveratrol dalam dapar fosfat *p*H 7,4

1,96 ppm = V_1 x 98 ppm = 10000 µL x 1,96 ppm = 200 µL
2,94 ppm = V_1 x 98 ppm = 10000 µL x 2,94 ppm = 300 µL
3,92 ppm = V_1 x 98 ppm = 10000 µL x 3,92 ppm = 400 µL
4,9 ppm = V_1 x 98 ppm = 10000 µL x 4,9 ppm = 500 µL
5,88 ppm = V_1 x 98 ppm = 10000 µL x 5,88 ppm = 600 µL



Nilai linieritas pada kurva kalibrasi resveratrol dalam dapar fosfat *p*H 7,4 yaitu:

Intercept (a) = 0.0256
Slope (b) = 0.101939
Koefisien korelasi (r) = 0.999666

2) Akurasi

Konsentrasi	Replikasi	Abs	Konsentrasi	Sebenarnya	%		Rata-rata
80%	1	0.332	3.005725726	2.94	102.24%	101.68%	
	2	0.326	2.946866867	2.94	100.23%		
	3	0.333	3.015535536	2.94	102.57%		
100%	1	0.426	3.927847848	3.92	100.20%	101.12%	101.57%
	2	0.429	3.957277277	3.92	100.95%		
	3	0.434	4.006326326	3.92	102.20%		
120%	1	0.535	4.997117117	4.9	101.98%	101.92%	
	2	0.535	4.997117117	4.9	101.98%		
	3	0.534	4.987307307	4.9	101.78%		

3) Presisi

Konsentrasi (ppm)	Abs	Konsentrasi
3.92	0.426	3.9278
3.92	0.429	3.9573
3.92	0.434	4.0063
3.92	0.498	4.6342
3.92	0.488	4.5361
3.92	0.489	4.5459
3.92	0.497	4.6243
3.92	0.497	4.6243
3.92	0.49	4.5557
	Rata-rata	4.3791
	SD	0.314144
	CV	0.071737

Perhitungan % RSD = $\frac{S}{X} \times 100\%$

$= \frac{0.314144}{4.3791} \times 100\% = 0{,}07173\%$

4) LOD & LOQ

X (ppm)	Y (abs)	y'	y-y'	(y-y')2
1.96	0.228	0.2254	0.0026	6.76E-06
2.94	0.326	0.3253	0.0007	4.9E-07
3.92	0.421	0.4252	-0.0042	1.764E-05
4.9	0.521	0.5251	-0.0041	1.681E-05
5.88	0.63	0.625	0.005	2.5E-05

Jumlah = 6.67E-05

Sy/x = 0.004083503

LOD = $\frac{3\ sy/x}{b}$ LOQ= $\frac{10\ sy/x}{b}$

$$\text{LOD} = \frac{3.3 \text{ x } 0.004083503}{0.101939} = 0.132192693$$

$$\text{LOQ} = \frac{10 \text{ x } 0.004083503}{0.101939} = 0.400583917$$

Lampiran 5. Hasil Pengujian Ukuran Partikel dan Indeks Polidispersitas

Size Distribution Report by Number

v2.2

Malvern

Sample Details

Sample Name: Formula 2 5
SOP Name: mansettings.nano
General Notes:

File Name:	Siti 2020.dts	**Dispersant Name:**	Water
Record Number:	5	**Dispersant RI:**	1.330
Material RI:	1.33	**Viscosity (mPa.s):**	0.8872
Material Absorbtion:	0.500	**Measurement Date and Time:**	Friday, February 14, 2020 ...

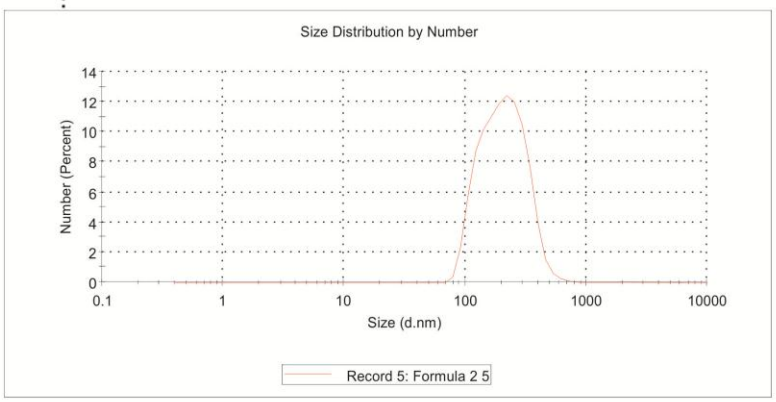
System

Temperature (°C):	25.0	**Duration Used (s):**	60
Count Rate (kcps):	293.9	**Measurement Position (mm):**	1.25
Cell Description:	Disposable sizing cuvette	**Attenuator:**	4

Results

			Size (d.n...	% Number:	St Dev (d.n...
Z-Average (d.nm):	388.2	**Peak 1:**	220.4	99.7	95.70
PdI:	0.520	**Peak 2:**	2526	0.3	1191
Intercept:	0.761	**Peak 3:**	0.000	0.0	0.000

Result quality : Refer to quality report



Lampiran 6. Hasil Pengujian Zeta potensial

Zeta Potential Report

v2.3

Malvern

Sample Details

Sample Name: Formula 2 3
SOP Name: mansettings.nano
General Notes:

File Name: Siti 2020.dts
Record Number: 8
Date and Time: Friday, February 14, 2020 11:0...
Dispersant Name: Water
Dispersant RI: 1.330
Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

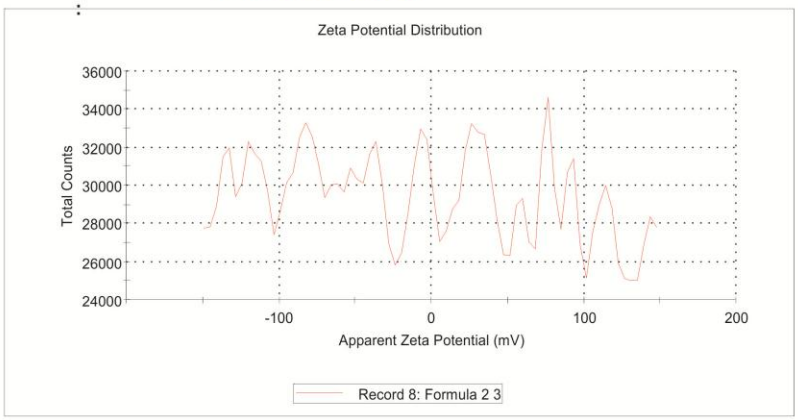
System

Temperature (°C): 25.0
Count Rate (kcps): 0.9
Cell Description: Zeta dip cell
Zeta Runs: 100
Measurement Position (mm): 4.50
Attenuator: 11

Results

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): 0.685	**Peak 1:**	28.1	14.5	13.9
Zeta Deviation (mV): 164	**Peak 2:**	-86.3	11.2	10.5
Conductivity (mS/cm): 0.0481	**Peak 3:**	-9.02	9.5	9.26

Result quality : See result quality report



Lampiran 7. Hasil Pengujian Efisiensi Penjerapan

Absorbansi = 0,336

$y = a + bx$

$y = 0,0138 + 0,1354x$

$0,336 = 0,0138 + 0,1354x$

$$x = \frac{0,336-0,0138}{0,1354}$$

$x = 2,3796 \times 10$

$x = 23,796$ mg / 1000 Ml

$x = 0,023796$

$$\%EP = \frac{Wa-Ws}{Wa} \times 100\%$$

$$= \frac{50-0,023796}{50} \times 100\%$$

$= 99,95\%$

Lampiran 8. Lampiran Hasil Uji pH

Replikasi	F1	F2	F3	F4
1	4,84	4,87	5,26	5,23
2	4,86	4,83	5,26	5,23
3	4,81	4,79	5,24	5,21
Rata-rata ± SD	4,84 ± 0,03	4,83 ± 0,04	5,25 ± 0,01	5,22 ± 0,01

Lampiran 9. Hasil Uji Viskositas

Replikasi	F1	F2	F3	F4
1	150	250	430	570
2	120	260	480	540
3	130	290	420	580
Rata-rata ± SD	1333,33 ± 15,28	266,67 ± 20,82	443,33 ± 32,1	563,33 ± 20,81

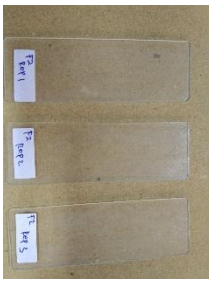
Lampiran 10. Hasil Uji Daya Sebar

Beban	Replikasi	Formula			
		1	**2**	**3**	**4**
Tidak ada	**1**	3,3	2,2	2,5	2,4
	2	3,4	2,2	2,3	2,2
	3	3,5	2,3	2,3	2,2
	Rata-rata ± SD	3,4 ± 0,1	2,23 ± 0,06	2,37 ± 0,12	2,33 ± 0,12
50	**1**	4,0	2,5	2,8	2,6
	2	4,0	2,5	2,7	2,8
	3	4,0	2,6	2,6	2,7
	Rata-rata ± SD	4 ± 4	2,53 ± 0,06	2,7 ± 0,1	2,7 ± 0,1
100	**1**	4,4	2,7	3,1	2,8
	2	4,5	2,8	3, 0	3,1
	3	4,5	2,8	3, 0	3, 0
	Rata-rata ± SD	4,5 ± 0	2,27 ± 0,06	3,03 ± 0,06	2,97 ± 0,15
150	**1**	4,7	2,9	3,4	3,1
	2	4,8	3,0	3,2	3,4
	3	4,9	3,0	3,2	3,2
	Rata-rata ± SD	4,77 ± 0,06	2,97 ± 2,97	3,27 ± 0,12	3,23 ± 0,15
200	**1**	5,1	3,1	3,5	3,3
	2	5,1	3,2	3,4	3,5
	3	5,2	3,1	3,3	3,3
	Rata-rata ± SD	5,1 ± 0	3,13 ± 0,06	3,4 ± 0,1	3,37 ± 0,12

Lampiran 11. Hasil Uji Daya Lekat

Replikasi	F1	F2	F3	F4
1	0,49	0,63	0,81	0,93
2	0,53	0,59	0,82	0,88
3	0,57	0,66	0,76	0,81
Rata-rata ± SD	0,53 ± 0,04	0,63 ± 0,04	0,80 ± 0,03	0,87 ± 0,06

Lampiran 12. Gambar Pengujian

No	Keterangan	Gambar
1	Gambar NLC resveratrol	
2	Gambar uji hoogenitas NLC resveratrol berbasis gel	   
3	Gambar NLC resveratrol berbasis gel