BAB V
KESIMPULAN DAN SARAN

A. Kesimpulan

Berdasarkan hasil penelitian optimasi natrium karboksi metil selulosa (Na-CMC) dan karbopol 941 pada sediaan gel dispersi oadat ibuprofen dengan metode *simplex lattice design* dapat disimpulkan :

1. Gel dispersi padat ibuprofen dengan campuran CMC-Na dan karbopol 941 memberikan mutu fisik yang meliputi organoleptis, homogenitas, daya lekat, daya sebar, pH, dan viskositas serta stabilitas yang baik.
2. Formula optimum gel dispersi padat ibuprofen diperoleh proporsi 3% Na-CMC dan 0% karbopol 941.

B. Saran

Saran dari penelitian berdasarkan hasil penelitian optimasi natrium karboksi metil selulosa (Na-CMC) dan karbopol 941 pada sediaan gel dispersi oadat ibuprofen dengan metode *simplex lattice design* yaitu :

1. Perlu dilakukan uji laju penetrasi secara *in vitro* untuk mengetahui jumlah obat yang terpenetrasi.
2. Perlu dilakukan penelitian lebih lanjut dengan variasi *gelling agent* lainnya untuk mendapatkan formula gel yang baik.

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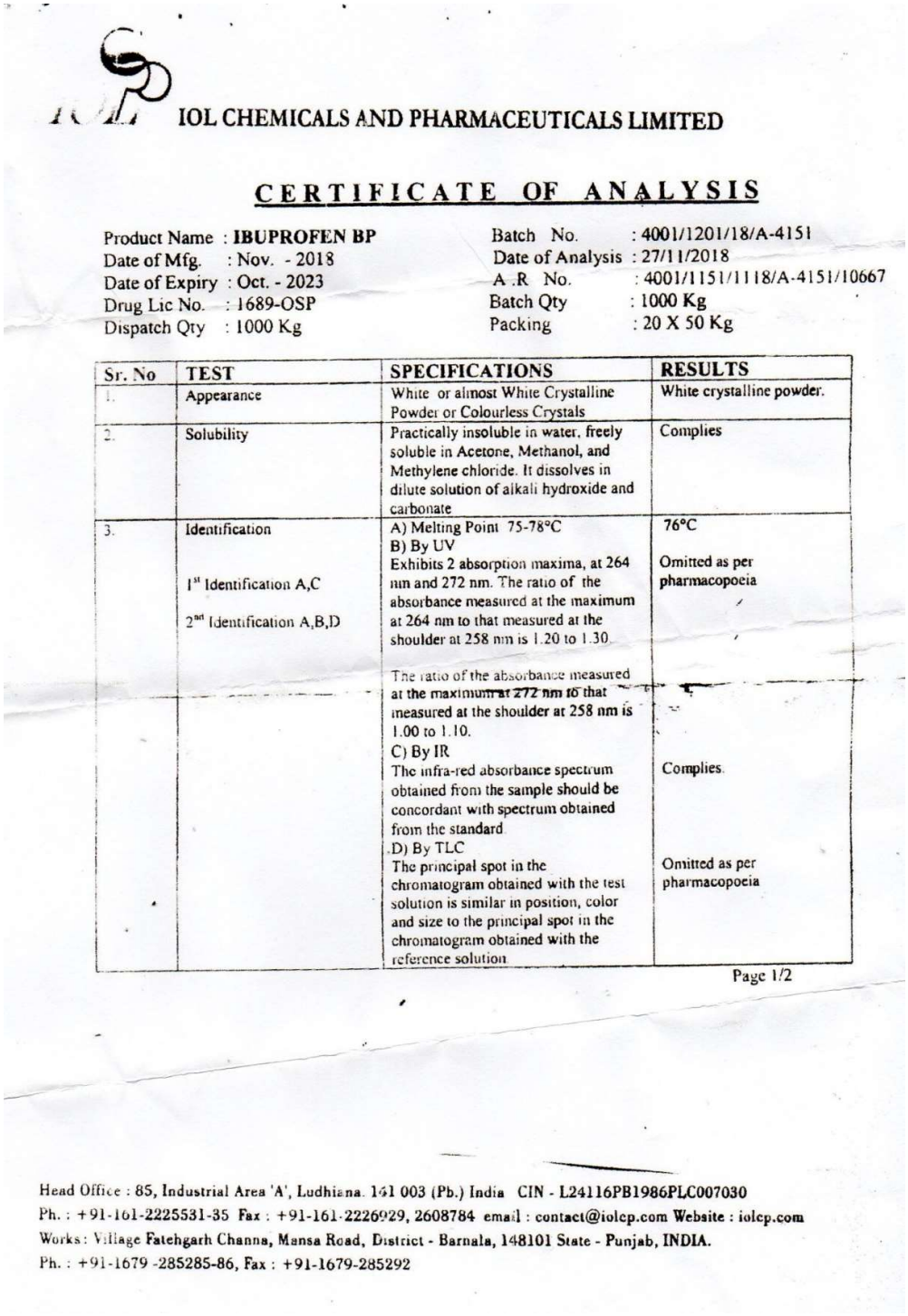
LAMPIRAN

Lampiran 1. Sertifikat analisis ibuprofen



IOL CHEMICALS AND PHARMACEUTICALS LIMITED

CERTIFICATE OF ANALYSIS

Product Name : **IBUPROFEN BP**
Date of Mfg. : Nov. - 2018
Date of Expiry : Oct. - 2023
Drug Lic No. : 1689-OSP
Dispatch Qty : 1000 Kg

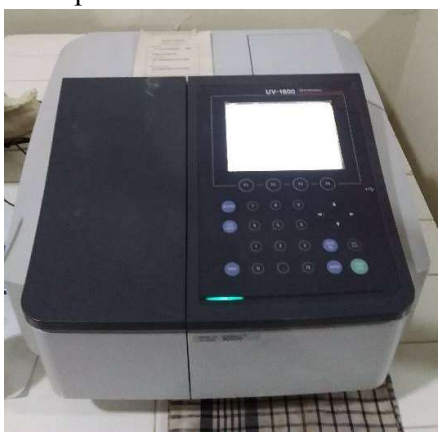
Batch No. : 4001/1201/18/A-4151
Date of Analysis : 27/11/2018
A .R No. : 4001/1151/1118/A-4151/10667
Batch Qty : 1000 Kg
Packing : 20 X 50 Kg

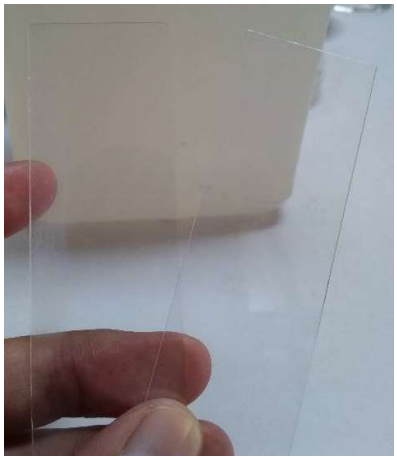
Sr. No	TEST	SPECIFICATIONS	RESULTS
1.	Appearance	White or almost White Crystalline Powder or Colourless Crystals	White crystalline powder.
2.	Solubility	Practically insoluble in water, freely soluble in Acetone, Methanol, and Methylene chloride. It dissolves in dilute solution of alkali hydroxide and carbonate	Complies
3.	Identification 1st Identification A,C 2nd Identification A,B,D	A) Melting Point 75-78°C B) By UV Exhibits 2 absorption maxima, at 264 nm and 272 nm. The ratio of the absorbance measured at the maximum at 264 nm to that measured at the shoulder at 258 nm is 1.20 to 1.30. The ratio of the absorbance measured at the maximum at 272 nm to that measured at the shoulder at 258 nm is 1.00 to 1.10. C) By IR The infra-red absorbance spectrum obtained from the sample should be concordant with spectrum obtained from the standard D) By TLC The principal spot in the chromatogram obtained with the test solution is similar in position, color and size to the principal spot in the chromatogram obtained with the reference solution	76°C Omitted as per pharmacopoeia Complies. Omitted as per pharmacopoeia

Page 1/2

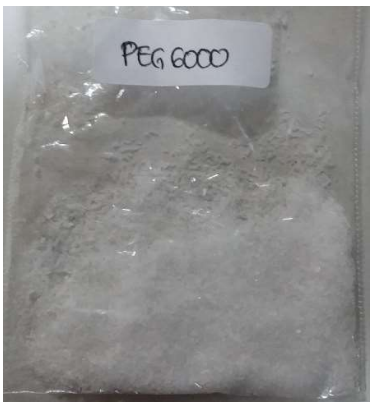
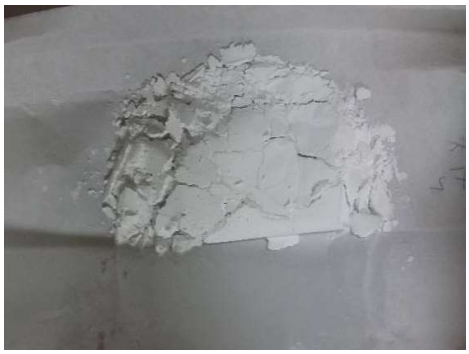
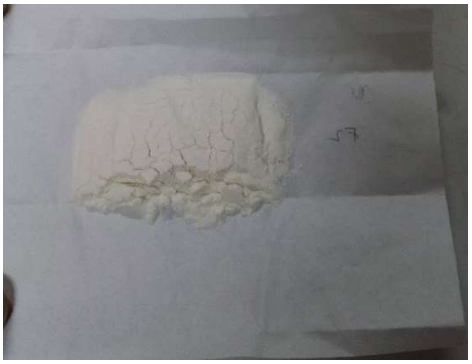
Head Office : 85, Industrial Area 'A', Ludhiana. 141 003 (Pb.) India CIN - L24116PB1986PLC007030
Ph. : +91-161-2225531-35 Fax : +91-161-2226929, 2608784 email : contact@iolcp.com Website : iolcp.com
Works : Village Fatehgarh Channa, Mansa Road, District - Barnala, 148101 State - Punjab, INDIA.
Ph. : +91-1679 -285285-86, Fax : +91-1679-285292

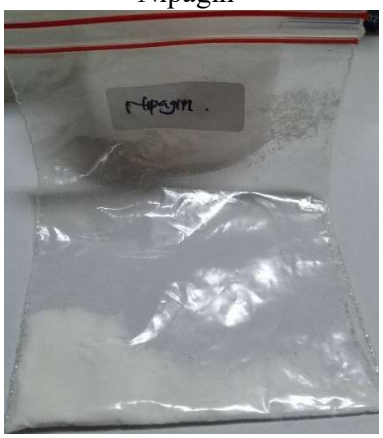
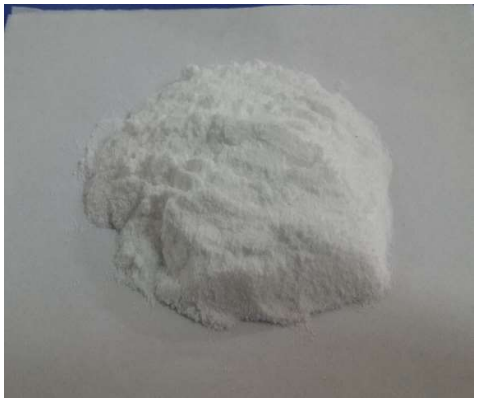
Lampiran 2. Gambar alat dan bahan penelitian

<table>
<tr><td colspan="2">Alat</td></tr>
<tr><td>Spektrofotometer UV-Vis
  </td><td>Spektroskopi Inframerah
  </td></tr>
<tr><td>Water Bath
  </td><td>Ice Bath
  </td></tr>
<tr><td>Mortir-Stamper
 
  </td><td>Cawan Porselin
  </td></tr>
</table>

Alat uji daya lekat 	Alat uji daya sebar 
Alat uji viskositas 	pH meter 
Alat uji homogenitas 	Timbangan analitik digital 

<table>
<tr><td>Ayakan mesh no 80
  </td><td>Pompa Hidrolik
  </td></tr>
<tr><td>Desikator
  </td><td>Alat-alat gelas
  </td></tr>
<tr><td colspan="2">Oven
  </td></tr>
</table>

Bahan	
Ibuprofen 	PEG 6000 
KBr 	Karbopol 
CMC-Na 	TEA 

Nipagin 	Dispersi padat ibuprofen-PEG 6000 
Larutan NaOH 	Aquadest 
Tween 80 	Propilen-glikol 

Lampiran 3. Penimbangan pembuatan dispersi padat dan penetapan kadar dispersi padat

A. Penimbangan pembuatan dispersi padat

Kertas timbang + ibuprofen = 0,042 mg

Kertas timbang + sisa = 0,002 mg –

Ibuprofen = 0,04 mg = 40 g

PEG 6000 = 0,06 mg = 60 g +

Total = 100 g

B. Penimbangan kurva baku

Kertas timbang + ibuprofen = 0,3675 g

Kertas timbang + sisa = 0,2641 g –

Ibuprofen = 0,1034 g = 103,4 mg/100 ml = 1034 ppm

Pengenceran kurva baku

V1 x N1 = V2 x N2

10 ml x **150 ppm** = V2 x 1000 ppm

V2 = 1,5 ml

V1 x N1 = V2 x N2

10 ml x **200 ppm** = V2 x 1000 ppm

V2 = 2 ml

V1 x N1 = V2 x N2

10 ml x **250 ppm** = V2 x 1000 ppm

V2 = 2,5 ml

V1 x N1 = V2 x N2

10 ml x **300 ppm** = V2 x 1000 ppm

V2 = 3 ml

V1 x N1 = V2 x N2

10 ml x **350 ppm** = V2 x 1000 ppm

V2 = 3,5 ml

V1 x N1 = V2 x N2

10 ml x **400 ppm** = V2 x 1000 ppm

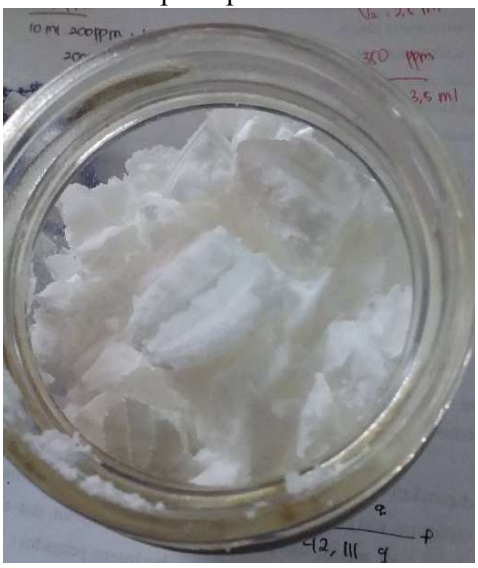
V2 = 4 ml

V1 x N1 = V2 x N2

10 ml x **450 ppm** = V2 x 1000 ppm

V2 = 4,5 ml

Lampiran 4. Foto hasil peleburan, pembekuan, dispersi padat kasar dan halus

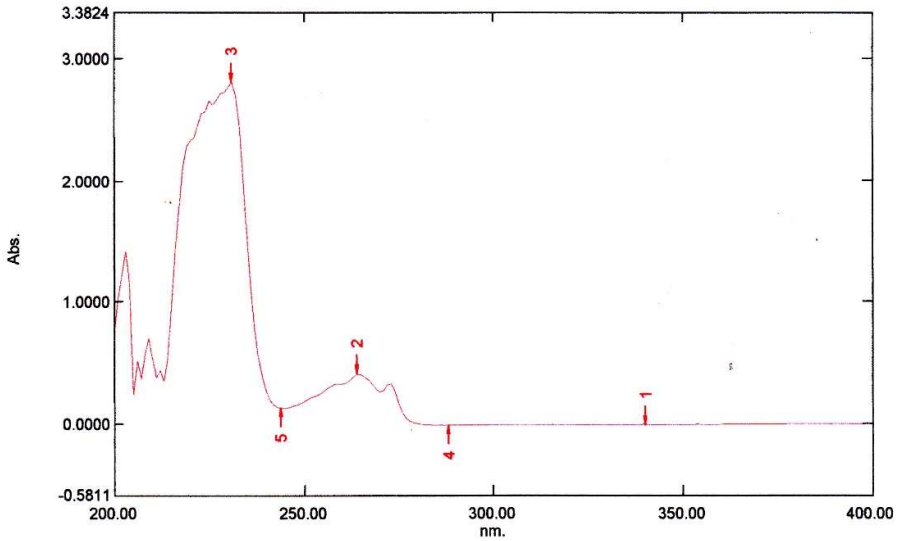
Peleburan PEG 6000 dan Ibuprofen 	Pembekuan leburan dispersi padat ibuprofen 
Dispersi padat kasar 	Dispersi padat halus 

Lampiran 5. Hasil penentuan panjang gelombang maksimum ibuprofen

Spectrum Peak Pick Report

02/01/2020 10:30:15 AM

Data Set: File_200201_102832 - RawData



No.	P/V	Wavelength	Abs.	Description
1	●	340.00	-0.0081	
2	●	264.00	0.4073	
3	●	231.00	2.8152	
4	▼	288.00	-0.0140	
5	▼	244.00	0.1251	

[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:

Lampiran 6. Hasil penetapan *operating time*

Kinetics Data Print Report

Time (Minute)	RawData ...
0.000	0.568
1.000	0.568
2.000	0.569
3.000	0.569
4.000	0.569
5.000	0.570
6.000	0.570
7.000	0.569
8.000	0.569
9.000	0.570
10.000	0.569
11.000	0.569
12.000	0.569
13.000	0.568
14.000	0.569
15.000	0.569
16.000	0.569
17.000	0.568
18.000	0.568
19.000	0.568
20.000	0.568
21.000	0.569
22.000	0.569
23.000	0.569
24.000	0.569
25.000	0.569
26.000	0.569
27.000	0.569
28.000	0.569
29.000	0.569
30.000	0.569

Lampiran 7. Perhitungan % *recovery* ibuprofen dalam dispersi padat

a = 0,0324

b = 0,0018

r = 0,9993

Y = a + bx

= 0,0324 + 0,0018x

A. Replikasi 1

Dispersi padat ibuprofen yang ditimbang:

Kertas timbang + dispersi = 307,8 mg

Kertas timbang + sisa = 276,7 mg –

Dispersi = 31,1 mg

Abs = 0,238

Dalam 31,1 mg dispersi padat mengandung ibuprofen sebanyak:

$$\frac{100\ gram\ dispersi\ padat}{40\ gram\ ibuprofen} = \frac{31{,}1\ mg\ dispersi\ padat}{x\ mg\ ibuprofen}$$

x = 12,44 mg ibuprofen

Kadar 12,44 mg ibuprofen yaitu:

$$\frac{12{,}44\ mg\ ibuprofen}{100\ ml\ lar.NaOH\ 0{,}1\ N}\ x\ 1000\ ppm = 124{,}4\ ppm$$

Kadar percobaan dengan spektrofotometer Uv-Vis:

Y = a + bx

0,238 = 0,0324 + 0,0018x

x = $\frac{0{,}238-0{,}0324}{0{,}0018}$

= 114,22 ppm

$$\%Recovery = \frac{114{,}222\ ppm}{124{,}4\ ppm}\ x\ 100\% = 91{,}82\%$$

B. Replikasi 2

Dispersi padat ibuprofen yang ditimbang:

Kertas timbang + dispersi = 298 mg

Kertas timbang + sisa = 266 mg –

Dispersi = 32 mg

Abs = 0,246

Dalam 32 mg dispersi padat mengandung ibuprofen sebanyak:

$$\frac{100\ gram\ dispersi\ padat}{40\ gram\ ibuprofen} = \frac{32\ mg\ dispersi\ padat}{x\ mg\ ibuprofen}$$

x = 12,8 mg ibuprofen

Kadar 12,8 mg ibuprofen yaitu:

$$\frac{12{,}8\ mg\ ibuprofen}{100\ ml\ lar.NaOH\ 0{,}1\ N}\ x\ 1000\ ppm = 128\ ppm$$

Kadar percobaan dengan spektrofotometer Uv-Vis:

Y = a + bx

0,246 = 0,0324 + 0,0018x

x = $\frac{0{,}246-0{,}0324}{0{,}0018}$

= 118,67 ppm

$$\%Recovery = \frac{118{,}67\ ppm}{128\ ppm}\ x\ 100\% = 92{,}72\%$$

C. Replikasi 3

Dispersi padat ibuprofen yang ditimbang:

Kertas timbang + dispersi = 306,0 mg

Kertas timbang + sisa = 275,5 mg –

Dispersi = 30,5 mg

Abs = 0,231

Dalam 30,5 mg dispersi padat mengandung ibuprofen sebanyak:

$$\frac{100\ gram\ dispersi\ padat}{40\ gram\ ibuprofen} = \frac{30{,}5\ mg\ dispersi\ padat}{x\ mg\ ibuprofen}$$

x = 12,2 mg ibuprofen

Kadar 12,2 mg ibuprofen yaitu:

$$\frac{12{,}2\ mg\ ibuprofen}{100\ ml\ lar.NaOH\ 0{,}1\ N}\ x\ 1000\ ppm = 122\ ppm$$

Kadar percobaan dengan spektrofotometer Uv-Vis:

Y = a + bx

0,231 = 0,0324 + 0,0018x

x = $\frac{0{,}231-0{,}0324}{0{,}0018}$

= 110,33 ppm

$$\%Recovery = \frac{110{,}33\ ppm}{122\ ppm}\ x\ 100\% = 90{,}43\%$$

Rata-rata *% recovery* = $\frac{91{,}82 + 92{,}72 + 90{,}43}{3} = 91{,}66\%$

SD = $\sqrt{\frac{(91{,}66-91{,}82)^2+ (91{,}66-92{,}71)^2+ (91{,}66-90{,}43)^2}{3-1}}$

= $\sqrt{\frac{0{,}0256+\ {,}1236+1{,}5129}{2}}$ = 1,1537

CV = $\frac{1{,}1537}{91{,}66} x\ 100\% = 1{,}26\%$

Lampiran 8. Perhitungan Penggunaan Ibuprofen dalam Formula Gel

Perbandingan ibuprofen : PEG 6000 = 1 : 1,5

Dalam 100 gram sediaan gel mengandung 2,5 gram dispersi padat ibuprofen-PEG 6000 terdiri atas 1 gram ibuprofen dan 1,5 gram PEG 6000. %*Recovery* ibuprofen dalam dispersi padat 91,66% sehingga dalam 2,5 gram dispersi padat mengandung 0,9166 gram ibuprofen.

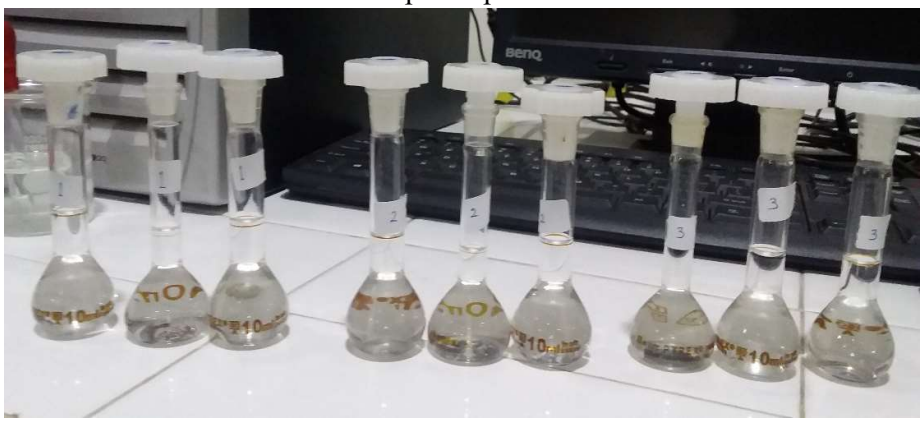
Pada formulasi 100 gram sediaan gel diinginkan mengandung 1 gram ibuprofen.

$$\frac{2{,}5\ gram\ dispersi\ padat}{x\ gram\ dispersi\ padat} = \frac{0{,}9166\ gram\ ibuprofen}{1\ gram\ ibuprofen}$$

x = 2,73 gram dispersi padat

Sehingga dapat disimpulkan bahwa dalam formulasi 100 gram sediaan gel mengandung 2,73% dispersi padat ibuprofen yang setara dengan 1% ibuprofen.

Lampiran 9. Foto larutan stok, penetapan %*recovery*, dan akurasi

<table>
<tr><td>Larutan stok
  </td><td>Larutan penetapan %recovery
  </td></tr>
<tr><td colspan="2">Larutan penetapan akurasi
  </td></tr>
</table>

Lampiran 10. Verifikasi metode analisis

A. Linearitas

V1 x N1 = V2 x N2

1,5 ml x 1034 ppm = 10 ml x N2

N2 = 155,1 ppm

V1 x N1 = V2 x N2

2 ml x 1034 ppm = 10 ml x N2

N2 = 206,8 ppm

V1 x N1 = V2 x N2

2,5 ml x 1034 ppm = 10 ml x N2

N2 = 258,5 ppm

V1 x N1 = V2 x N2

3 ml x 1034 ppm = 10 ml x N2

N2 = 310,2 ppm

V1 x N1 = V2 x N2

3,5 ml x 1034 ppm = 10 ml x N2

N2 = 361,9 ppm

V1 x N1 = V2 x N2

4 ml x 1034 ppm = 10 ml x N2

N2 = 413,6 ppm

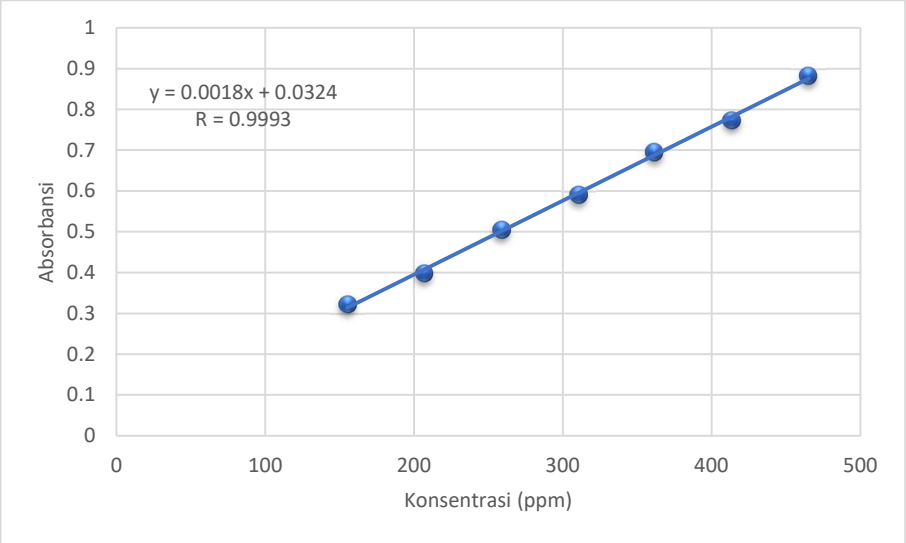
V1 x N1 = V2 x N2

4,5 ml x 1034 ppm = 10 ml x N2

N2 = 465,3 ppm

Konsentrasi	Absorbansi
155.1	0.322
206.8	0.397
258.5	0.504
310.2	0.591
361.9	0.694
413.6	0.773
465.3	0.883

a	0.0324
b	0.0018
r	0.9993



A. Akurasi

Pengambilan larutan:

$$80\% \rightarrow \frac{80}{100} \text{ x } 310{,}2 = 248{,}16 \text{ ppm} \rightarrow \frac{248{,}16 \text{ ppm x } 10 \text{ ml}}{1034 \text{ ppm}} = 2{,}48 \text{ ml} \approx 2{,}5 \text{ ml}$$

$$100\% \rightarrow \frac{100}{100} \text{ x } 310{,}2 = 310{,}2 \text{ ppm} \rightarrow \frac{310{,}2 \text{ ppm x } 10 \text{ ml}}{1034 \text{ ppm}} = 3 \text{ ml}$$

$$120\% \rightarrow \frac{120}{100} \text{ x } 310{,}2 = 372{,}24 \text{ ppm} \rightarrow \frac{372{,}24 \text{ ppm x } 10 \text{ ml}}{1034 \text{ ppm}} = 3{,}6 \text{ ml} \approx 3{,}5 \text{ ml}$$

KONSENTRASI	REPLIKASI	ABS	KONSENTRASI	PPM SEBENARNYA	%	RATA-RATA	RECOVERY
	1	0.491	252.9262	258.5	98%		
	2	0.497	256.2350	258.5	99%	99.34%	
80%	3	0.506	261.1982	258.5	101%		
	1	0.589	306.9700	310.2	99%		
	2	0.588	306.4185	310.2	99%	98.84%	99.09%
100%	3	0.588	306.4185	310.2	99%		
	1	0.676	354.9476	361.9	98%		
	2	0.69	362.6681	361.9	100%	99.35%	
120%	3	0.687	361.0137	361.9	100%		

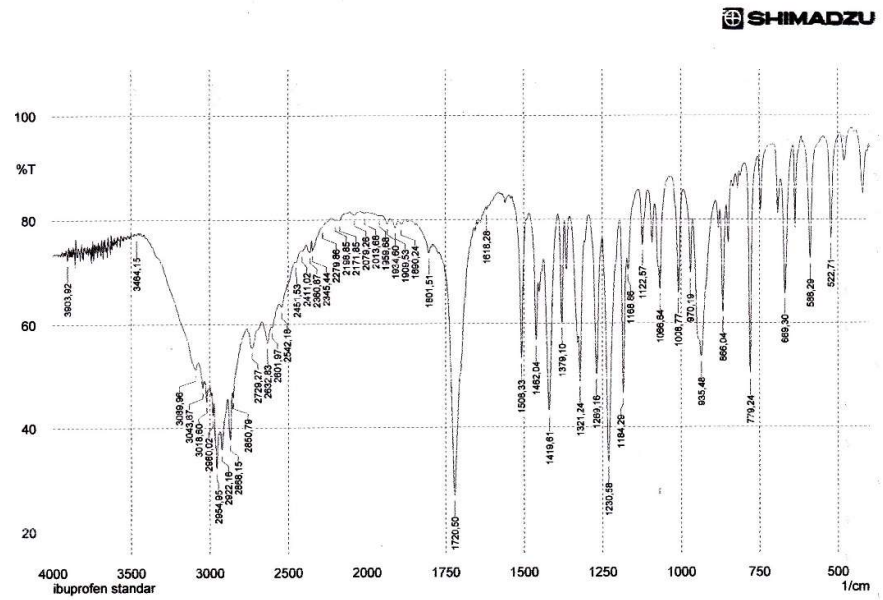
B. Presisi

REPLIKASI	ABSORBANSI	KONSENTRASI
1	0.267	129.3977
2	0.272	132.1550
3	0.266	128.8462
4	0.271	131.6036
5	0.273	132.7065
6	0.268	129.9492
7	0.27	131.0521
8	0.274	133.2580
9	0.267	129.3977
10	0.272	132.1550

SD	1.559783
RATA-RATA	131.0521
CV	1.190201

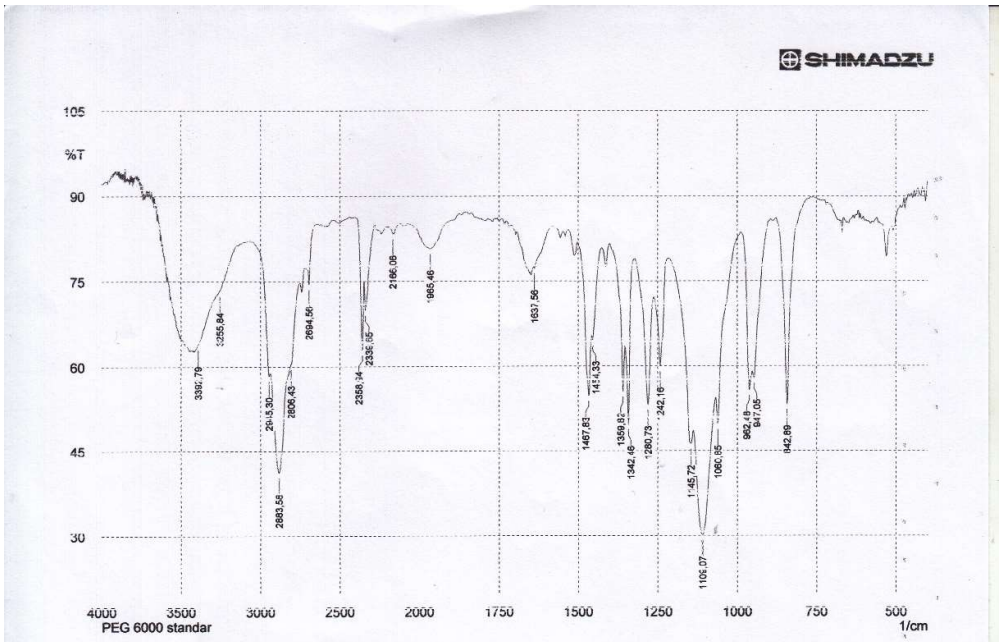
Lampiran 11. Hasil spektra IR

a. Ibuprofen



	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	522,71	76,352	19,952	545,85	493,78	2,072	1,231
2	588,29	72,492	23,266	615,29	547,78	3,011	1,757
3	669,3	65,632	24,135	680,87	644,22	3,168	1,685
4	779,24	50,13	41,196	796,6	756,1	3,829	2,257
5	866,04	62,106	19,629	873,75	856,39	2,447	0,94
6	935,48	53,583	5,99	941,26	889,18	8,15	0,41
7	970,19	69,662	11,443	991,41	964,41	2,698	0,45
8	1008,77	65,887	20,865	1031,92	993,34	3,665	1,321
9	1066,64	66,635	5,788	1070,49	1033,85	3,129	0,145
10	1122,57	75,089	10,604	1134,14	1105,21	2,529	0,588
11	1168,86	70,298	2,202	1170,79	1136,07	3,216	0,063
12	1184,29	46,441	29,934	1193,94	1172,72	4,282	1,712
13	1230,58	33,377	44,276	1249,87	1195,87	12,387	6,613
14	1269,16	50,184	27,89	1292,31	1251,8	6,815	2,504
15	1321,24	48,719	12,755	1325,1	1309,67	3,332	0,613
16	1379,1	60,118	20,15	1390,68	1371,39	2,816	0,981
17	1419,61	43,251	32,481	1436,97	1392,61	9,099	4
18	1462,04	56,709	13,513	1481,33	1456,26	3,936	0,612
19	1508,33	53,193	28	1537,27	1494,83	5,739	2,063
20	1618,28	81,9	0,643	1620,21	1581,63	2,987	0,044
21	1720,5	26,896	48,728	1768,72	1658,78	26,391	13,24
22	1801,51	73,554	2,616	1840,09	1789,94	5,899	0,232
23	1890,24	79,113	0,708	1899,88	1878,67	2,113	0,039
24	1909,53	78,414	1,443	1924,96	1901,81	2,329	0,075
25	1934,6	79,203	1,171	1953,89	1926,89	2,6	0,055
26	1959,68	80,784	0,086	1984,75	1955,82	2,651	0,01
27	2013,68	81,181	0,359	2038,76	2000,18	3,451	0,036
28	2079,26	80,872	0,65	2106,27	2056,12	4,549	0,099
29	2171,85	79,891	0,102	2173,78	2144,84	2,714	0,008
30	2198,85	79,907	0,156	2223,92	2193,06	2,976	0,011
31	2279,86	78,544	0,154	2283,72	2225,85	5,766	0,009
32	2345,44	74,07	2,047	2349,3	2285,65	7,403	0,289
33	2360,87	73,768	2,033	2385,95	2351,23	4,441	0,231

b. PEG 6000

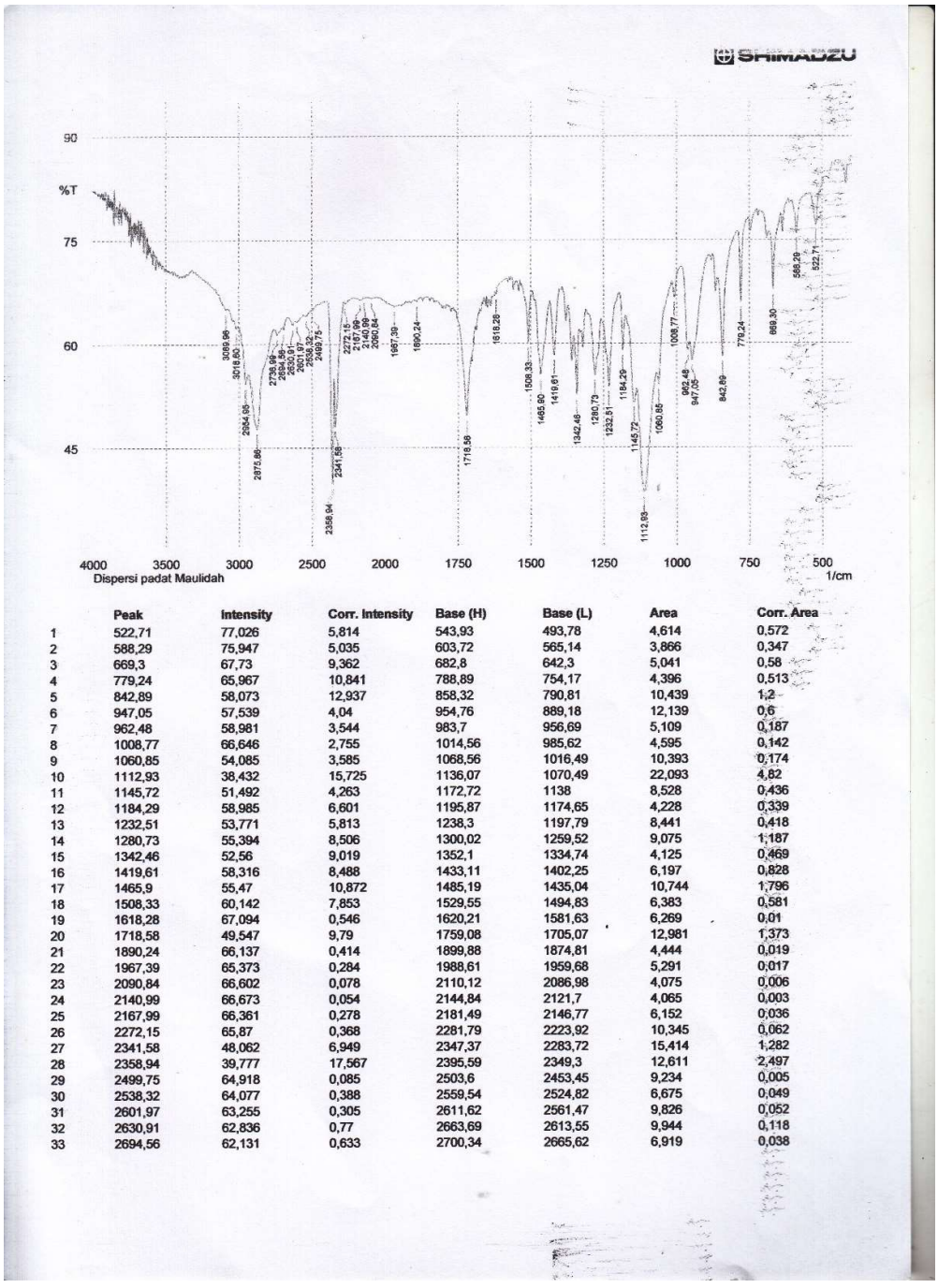


PEG 6000 standar

	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	842,89	53,193	34,094	875,68	781,17	10,137	4,812
2	947,05	57,822	2,801	960,91	894,97	7,181	0,11
3	962,48	55,698	10,165	987,55	952,84	5,72	0,618
4	1000,85	49,705	6,718	1066,64	989,48	11,26	0,33
5	1109,07	30,145	20,841	1138	1068,56	28,241	8,21
6	1145,72	46,241	4,307	1215,15	1139,93	13,932	0,406
7	1242,16	59,936	15,195	1261,45	1217,08	6,98	1,619
8	1280,73	53,134	21,024	1321,24	1263,37	10,005	2.887
9	1342,46	49,62	18,745	1352,1	1323,17	5,108	0,996
10	1359,82	55,445	10,301	1400,32	1354,03	6,597	0,417
11	1454,33	64,638	2,715	1458,18	1427,32	4,096	0,105
12	1467,83	54,715	14,444	1500,62	1458,18	7,119	1,343
13	1637,56	77,214	0,523	1639,49	1581,63	5,176	0,021
14	1965,46	80,72	4,8	2056,12	1894,1	12,736	1,694
15	2166,06	83,36	1,381	2183,42	2121,7	4,56	0,193
16	2339,65	69,892	6,112	2347,37	2283,72	6,985	0,793
17	2358,94	62,909	14,027	2405,23	2349,3	8,331	1,265
18	2694,56	74,425	3,834	2702,27	2646,34	4,883	0,173
19	2806,43	60,399	0.535	2808,36	2752,42	9.106	0.054
20	2883,58	41,212	18,289	2937,59	2808,36	38,316	9,308
21	2945,3	58,35	1,655	3047,53	2939,52	14,027	0,101
22	3255,84	73,344	0,191	3257,77	3145,9	12,285	0,026
23	3392,79	63,75	0,145	3394,72	3277,06	19,352	0,022

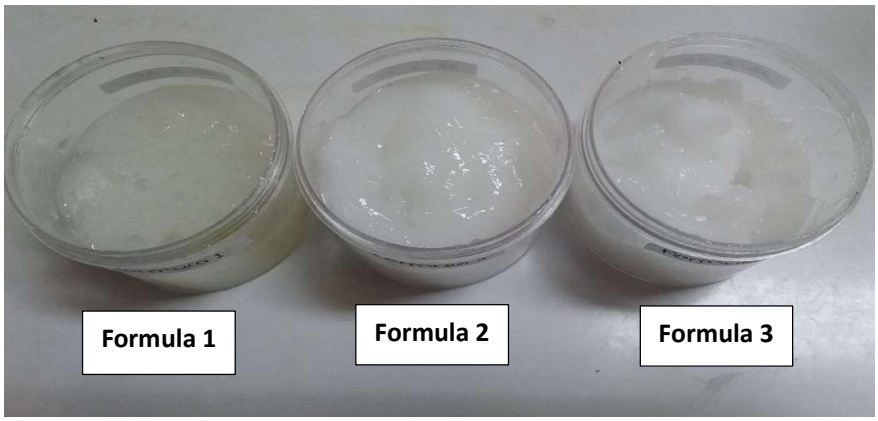
Date/Time; 18/02/2020 15:44:17
No. of Scans; 10
Resolution; 4 [1/cm]

c. Dispersi padat



	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	522,71	77,026	5,814	543,93	493,78	4,614	0,572
2	588,29	75,947	5,035	603,72	565,14	3,866	0,347
3	669,3	67,73	9,362	682,8	642,3	5,041	0,58
4	779,24	65,967	10,841	788,89	754,17	4,396	0,513
5	842,89	58,073	12,937	858,32	790,81	10,439	1,2
6	947,05	57,539	4,04	954,76	889,18	12,139	0,6
7	962,48	58,981	3,544	983,7	956,69	5,109	0,187
8	1008,77	66,646	2,755	1014,56	985,62	4,595	0,142
9	1060,85	54,085	3,585	1068,56	1016,49	10,393	0,174
10	1112,93	38,432	15,725	1136,07	1070,49	22,093	4,82
11	1145,72	51,492	4,263	1172,72	1138	8,528	0,436
12	1184,29	58,985	6,601	1195,87	1174,65	4,228	0,339
13	1232,51	53,771	5,813	1238,3	1197,79	8,441	0,418
14	1280,73	55,394	8,506	1300,02	1259,52	9,075	1,187
15	1342,46	52,56	9,019	1352,1	1334,74	4,125	0,469
16	1419,61	58,316	8,488	1433,11	1402,25	6,197	0,828
17	1465,9	55,47	10,872	1485,19	1435,04	10,744	1,796
18	1508,33	60,142	7,853	1529,55	1494,83	6,383	0,581
19	1618,28	67,094	0,546	1620,21	1581,63	6,269	0,01
20	1718,58	49,547	9,79	1759,08	1705,07	12,981	1,373
21	1890,24	66,137	0,414	1899,88	1874,81	4,444	0,019
22	1967,39	65,373	0,284	1988,61	1959,68	5,291	0,017
23	2090,84	66,602	0,078	2110,12	2086,98	4,075	0,006
24	2140,99	66,673	0,054	2144,84	2121,7	4,065	0,003
25	2167,99	66,361	0,278	2181,49	2146,77	6,152	0,036
26	2272,15	65,87	0,368	2281,79	2223,92	10,345	0,062
27	2341,58	48,062	6,949	2347,37	2283,72	15,414	1,282
28	2358,94	39,777	17,567	2395,59	2349,3	12,611	2,497
29	2499,75	64,918	0,085	2503,6	2453,45	9,234	0,005
30	2538,32	64,077	0,388	2559,54	2524,82	6,675	0,049
31	2601,97	63,255	0,305	2611,62	2561,47	9,826	0,052
32	2630,91	62,836	0,77	2663,69	2613,55	9,944	0,118
33	2694,56	62,131	0,633	2700,34	2665,62	6,919	0,038

Lampiran 12. Foto hasil uji mutu fisik gel dispersi padat ibuprofen

<table>
<tr><td colspan="3">Pengamatan organoleptis
 
</td></tr>
<tr><td colspan="3">Uji homogenitas</td></tr>
<tr><td>Formula 1
  </td><td>Formula 2
  </td><td>Formula 3
  </td></tr>
</table>

Lampiran 13. Foto uji daya sebar dan daya lekat

<table>
<tr><td colspan="2">Uji daya sebar</td></tr>
<tr><td>Tanpa beban
  </td><td>Beban 50 g
  </td></tr>
<tr><td>Beban 100 g
  </td><td>Beban 150 g
  </td></tr>
<tr><td colspan="2">Uji daya lekat</td></tr>
<tr><td colspan="2">  </td></tr>
</table>

Lampiran 14. Data uji viskositas, daya lekat, dan daya sebar

Uji	Formula	Replikasi	Hasil	Rata-rata
Viskositas (dpa's)	1	1	250	255
		2	260	
		3	255	
	2	1	210	203,33
		2	200	
		3	200	
	3	1	300	303,33
		2	310	
		3	300	
Daya Lekat (detik)	1	1	1	1,03
		2	1,1	
		3	1	
	2	1	1	1,04
		2	1,05	
		3	1,08	
	3	1	1,3	1,3
		2	1,4	
		3	1,2	

Daya Sebar

Replikasi	Tanpa beban			50 g			100 g			150 g		
	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3
1	2,2	2,3	2,2	2,8	2,9	2,5	3	3,3	2,8	3,6	3,6	2,9
	2,4	2,4	2,3	2,9	3	2,5	3,2	3,5	2,8	3,6	3,7	2,9
	2,4	2,6	2,2	2,9	3	2,4	3,2	3,4	2,6	3,5	3,7	2,9
	2,3	2,7	2,1	2,7	3,1	2,4	3,1	3,6	2,6	3,4	3,8	2,8
Rata-rata	2,3	2,5	2,2	2,8	3	2,6	3,1	3,5	2,7	3,5	3,7	2,9

Replikasi	Tanpa beban			50 g			100 g			150 g		
	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3
2	2,3	2,4	2,3	2,9	2,9	2,7	3,1	3,2	3	3,4	3,3	3,2
	2,5	2,5	2,3	2,8	2,8	2,8	3,3	3,3	3	3,5	3,7	3,3
	2,4	2,6	2,4	2,7	3	2,8	3,3	3,4	3,1	3,6	3,8	3,4
	2,4	2,8	2,3	2,6	3,2	2,7	3,2	3,5	3	3,5	3,8	3,3
Rata-rata	2,4	2,6	2,3	2,8	3	2,7	3,2	3,6	3	3,5	3,7	3,3

Replikasi	Tanpa beban			50 g			100 g			150 g		
	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3
3	2,5	2,5	2,2	2,7	2,9	2,4	3	3,2	2,7	3,3	3,5	3
	2,4	2,4	2,3	2,6	3	2,5	2,9	3,3	2,8	3,2	3,7	3,1
	2,3	2,7	2,2	2,7	3,1	2,6	3,1	3,4	2,9	3,4	3,7	3,2
	2,4	2,6	2,1	2,8	3,1	2,5	3,3	3,4	2,9	3,7	3,8	3,4
Rata-rata	2,4	2,6	2,2	2,7	3	2,5	3,1	3,3	2,8	3,4	3,7	3,2

Lampiran 15. Data analisis *One Way* ANOVA

a. pH

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
pH	9	5.2744	.99008	4.50	6.60

One-Sample Kolmogorov-Smirnov Test

		pH
N		9
Normal Parameters[a,b]	Mean	5.2744
	Std. Deviation	.99008
Most Extreme Differences	Absolute	.379
	Positive	.379
	Negative	-.240
Kolmogorov-Smirnov Z		1.137
Asymp. Sig. (2-tailed)		.151

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

pH

Levene Statistic	df1	df2	Sig.
1.639	2	6	.270

ANOVA

pH

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.840	2	3.920	14112.640	.000
Within Groups	.002	6	.000		
Total	7.842	8			

b. Daya sebar

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
dayasebar	9	3.433	.2693	2.9	3.7

One-Sample Kolmogorov-Smirnov Test

		Dayasebar
N		9
Normal Parameters[a,b]	Mean	3.433
	Std. Deviation	.2693
Most Extreme Differences	Absolute	.172
	Positive	.161
	Negative	-.172
Kolmogorov-Smirnov Z		.517
Asymp. Sig. (2-tailed)		.952

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

dayasebar

Levene Statistic	df1	df2	Sig.
7.800	2	6	.021

ANOVA

dayasebar

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.487	2	.243	15.643	.004
Within Groups	.093	6	.016		
Total	.580	8			

c. Daya lekat

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
dayalekat	9	1.1256	.14449	1.00	1.40

One-Sample Kolmogorov-Smirnov Test

		Dayalekat
N		9
Normal Parameters[a,b]	Mean	1.1256
	Std. Deviation	.14449
Most Extreme Differences	Absolute	.237
	Positive	.237
	Negative	-.192
Kolmogorov-Smirnov Z		.711
Asymp. Sig. (2-tailed)		.694

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

dayalekat

Levene Statistic	df1	df2	Sig.
.794	2	6	.494

ANOVA

dayalekat

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.137	2	.069	13.739	.006
Within Groups	.030	6	.005		
Total	.167	8			

d. Viskositas

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
viskositas	9	253.89	43.573	200	310

One-Sample Kolmogorov-Smirnov Test

		viskositas
N		9
Normal Parameters[a,b]	Mean	253.89
	Std. Deviation	43.573
Most Extreme Differences	Absolute	.188
	Positive	.176
	Negative	-.188
Kolmogorov-Smirnov Z		.565
Asymp. Sig. (2-tailed)		.907

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

viskositas

Levene Statistic	df1	df2	Sig.
.235	2	6	.797

ANOVA

viskositas

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15005.556	2	7502.778	245.545	.000
Within Groups	183.333	6	30.556		
Total	15188.889	8			

Lampiran 16. Penentuan formula optimum

Select	Std	Run	Component 1 A:Na-CMC %	Component 2 B:Karbopol 9 %	Response 1 Daya sebar cm	Response 2 Daya lekat detik	Response 3 Viskositas dpa's
	2	1	0	3	3.5	1	250
	5	2	0	3	3.5	1.1	260
	4	3	0	3	3.4	1	255
	3	4	1.5	1.5	3.7	1	210
	7	5	1.5	1.5	3.7	1.05	200
	6	6	1.5	1.5	3.7	1.08	200
	1	7	3	0	2.9	1.3	300
	8	8	3	0	3.3	1.4	310
	9	9	3	0	3.2	1.2	300

Lampiran 17. Hasil *ANOVA Simplex Lattice Design*

A. Daya sebar

Transform | Fit Summary | Model | ANOVA

Use your mouse to right click on individual cells for definitions.

Response 1 Daya sebar

ANOVA for Quadratic Mixture model

***** Mixture Component Coding is L_Pseudo. *****

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	0.49	2	0.24	15.64	0.0042	significant
[1] Linear Mixtu	*0.17*	*1*	*0.17*	*10.71*	*0.0170*	
AB	*0.32*	*1*	*0.32*	*20.57*	*0.0040*	
Pure Error	0.093	6	0.016			
Cor Total	0.58	8				

[1] Inference for linear mixtures uses Type I sums of squares.

The Model F-value of 15.64 implies the model is significant. There is only a 0.42% chance that an F-value this large could occur due to noise.

Std. Dev.	0.12	R-Squared	0.8391
Mean	3.43	Adj R-Squared	0.7854
C.V. %	3.63	Pred R-Square	0.6379
PRESS	0.21	Adeq Precisior	7.869
-2 Log Likeliho	-15.58	BIC	-11.18
		AICc	-9.58

The "Pred R-Squared" of 0.6379 is in reasonable agreement with the "Adj R-Squared" of 0.7854; i.e. the difference is less than 0.2.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 7.869 indicates an adequate signal. This model can be used to navigate the design space.

Component	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
A-Na-CMC	3.13	1	0.072	2.96	3.31	1.25
B-Karbopol 94	3.47	1	0.072	3.29	3.64	1.25
AB	1.60	1	0.35	0.74	2.46	1.50

B. Daya lekat

Transform | Fit Summary | Model | ANOVA

Use your mouse to right click on individual cells for definitions.

Response 2 Daya lekat

ANOVA for Quadratic Mixture model

***** Mixture Component Coding is L_Pseudo. *****

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	0.14	2	0.069	13.74	0.0058	significant
1 Linear Mixtu	*0.11*	*1*	*0.11*	*21.38*	*0.0036*	
AB	*0.030*	*1*	*0.030*	*6.10*	*0.0485*	
Pure Error	0.030	6	4.989E-003			
Cor Total	0.17	8				

1 Inference for linear mixtures uses Type I sums of squares.

The Model F-value of 13.74 implies the model is significant. There is only a 0.58% chance that an F-value this large could occur due to noise.

Std. Dev.	0.071	R-Squared	0.8208
Mean	1.13	Adj R-Squared	0.7610
C.V. %	6.28	Pred R-Square	0.5968
PRESS	0.067	Adeq Precisior	6.539
-2 Log Likeliho	-25.81	BIC	-21.42
		AICc	-19.81

The "Pred R-Squared" of 0.5968 is in reasonable agreement with the "Adj R-Squared" of 0.7610; i.e. the difference is less than 0.2.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 6.539 indicates an adequate signal. This model can be used to navigate the design space.

Component	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
A-Na-CMC	1.30	1	0.041	1.20	1.40	1.25
B-Karbopol 94	1.03	1	0.041	0.93	1.13	1.25
AB	-0.49	1	0.20	-0.98	-4.495E-003	1.50

C. Viskositas

Transform | Fit Summary | Model | ANOVA

Use your mouse to right click on individual cells for definitions.

Response 3 Viskositas

ANOVA for Quadratic Mixture model

***** Mixture Component Coding is L_Pseudo. *****

Analysis of variance table [Partial sum of squares - Type III]

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	15005.56	2	7502.78	245.55	< 0.0001	significant
1 Linear Mixtu	*3504.17*	*1*	*3504.17*	*114.68*	*< 0.0001*	
AB	*11501.39*	*1*	*11501.39*	*376.41*	*< 0.0001*	
Pure Error	183.33	6	30.56			
Cor Total	15188.89	8				

1 Inference for linear mixtures uses Type I sums of squares.

The Model F-value of 245.55 implies the model is significant. There is only a 0.01% chance that an F-value this large could occur due to noise.

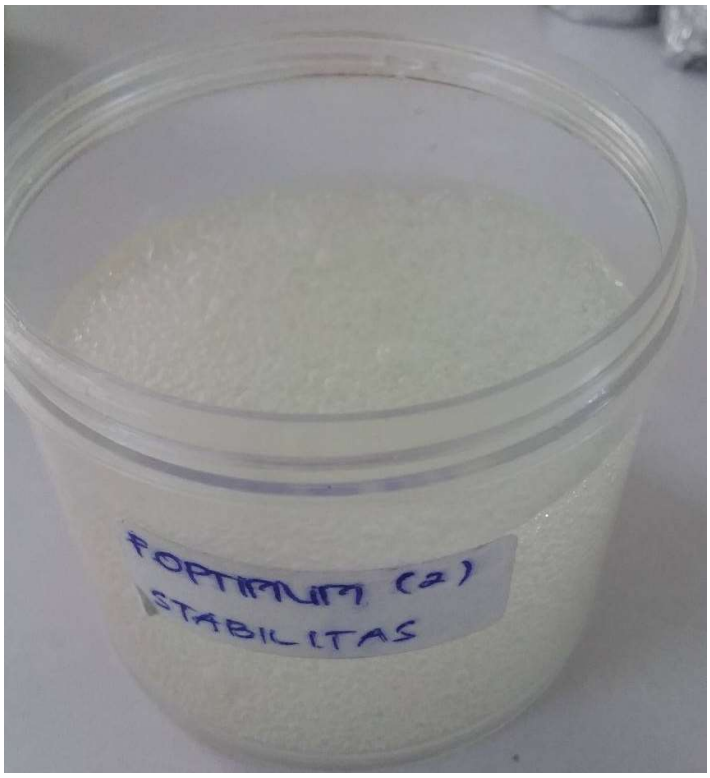
Std. Dev.	5.53	R-Squared	0.9879
Mean	253.89	Adj R-Squared	0.9839
C.V. %	2.18	Pred R-Square	0.9728
PRESS	412.50	Adeq Precisior	31.334
-2 Log Likeliho	52.67	BIC	57.06
		AICc	58.67

The "Pred R-Squared" of 0.9728 is in reasonable agreement with the "Adj R-Squared" of 0.9839; i.e. the difference is less than 0.2.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 31.334 indicates an adequate signal. This model can be used to navigate the design space.

Component	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
A-Na-CMC	303.33	1	3.19	295.52	311.14	1.25
B-Karbopol 94	255.00	1	3.19	247.19	262.81	1.25
AB	-303.33	1	15.63	-341.59	-265.08	1.50

Lampiran 18. Foto hasil gel dispersi padat dari formula optimum



Lampiran 19. Data uji viskositas, daya lekat, dan daya sebar formula optimum

Uji	Replikasi	Hasil	Rata-rata
Viskositas (dpa's)	1	300	301,67
	2	305	
	3	300	
Daya Lekat (detik)	1	1,46	1,316
	2	1,35	
	3	1,14	

Daya sebar

Beban	Replikasi 1 (cm)	Replikasi 2 (cm)	Replikasi 3 (cm)	Rata-rata
Tanpa beban	2,3	2,4	2,4	2,4
50 g	2,5	2,5	2,7	2,6
100 g	2,9	2,8	3	2,9
150 g	3,2	3,3	3,2	3,2

Lampiran 20. Data analisis *one sample t-test*

a. Daya sebar

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
dayasebar	3	3.233	.0577	.0333

One-Sample Test

	Test Value = 3.2					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
dayasebar	1.000	2	.423	.0333	-.110	.177

b. Daya lekat

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
dayalekat	3	1.3167	.16258	.09387

One-Sample Test

	Test Value = 1.3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
dayalekat	.178	2	.875	.01667	-.3872	.4205

c. Viskositas

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
viskositas	3	301.67	2.887	1.667

One-Sample Test

	Test Value = 303.33					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
viskositas	-.998	2	.423	-1.663	-8.83	5.51

Lampiran 21. Foto hasil stabilitas dari formula optimum

Siklus 1 	Siklus 2 
Siklus 3 	Siklus 4 
Siklus 5 	Siklus 6