

BAB V

KESIMPULAN

A. Kesimpulan

Pertama, kombinasi komponen *effervescent* asam sitrat dan PEG 4000 menghasilkan formula optimum asam sitrat 15% dan PEG 4000 sebesar 4 bagian dari asam. PEG 4000 memberikan pengaruh yang paling dominan pada parameter titik kritis seperti peningkatan kelarutan dan DE15, sedangkan asam sitrat memberikan pengaruh yang dominan pada parameter titik kritis peningkatan kelembapan, dan kombinasi keduanya memberikan pengaruh paling dominan terhadap parameter titik kritis Q3.

Kedua, karakterisasi tablet *effervescent* meloksikam optimum berpengaruh terhadap waktu larut, stabilitas tablet dan keseragaman sediaan.

B. Saran

Pertama, perlu dilakukan penelitian lain dengan menggunakan kombinasi pembawa dispersi yang lain.

Kedua, perlu dilakukan pengujian karakterisasi lebih lanjut menggunakan DSC dan XRD.

Ketiga, praktikum perlu dilakukan pada suhu dan ruangan yang memiliki kelembapan terkontrol sesuai dengan persyaratan sediaan *effervescent*.

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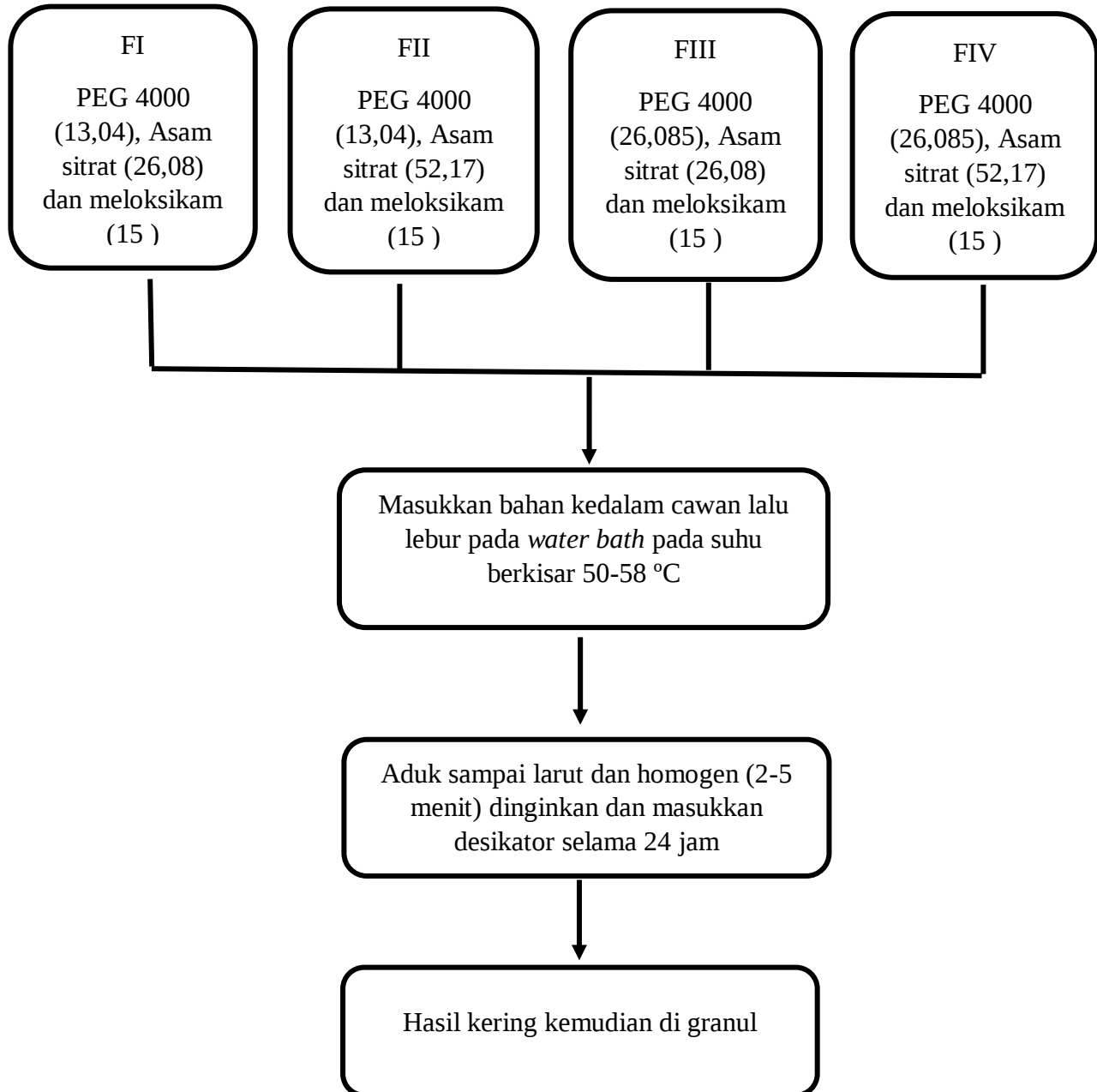
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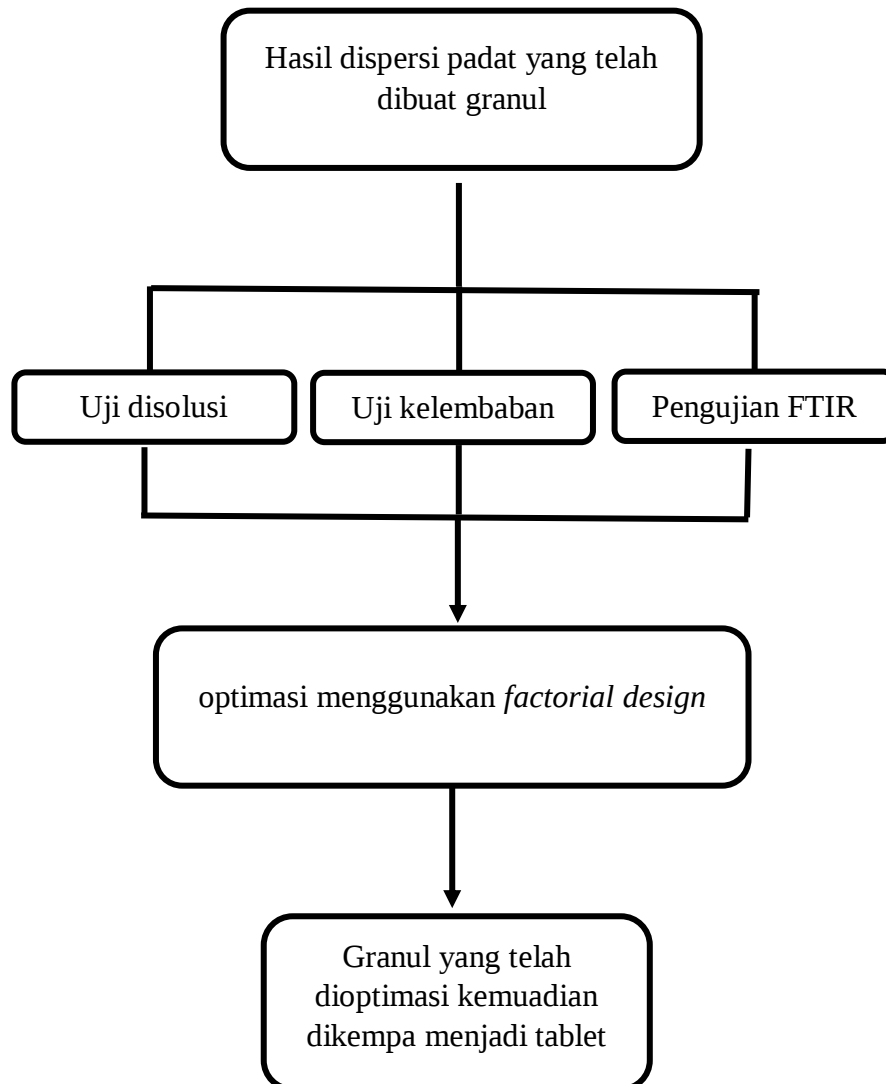
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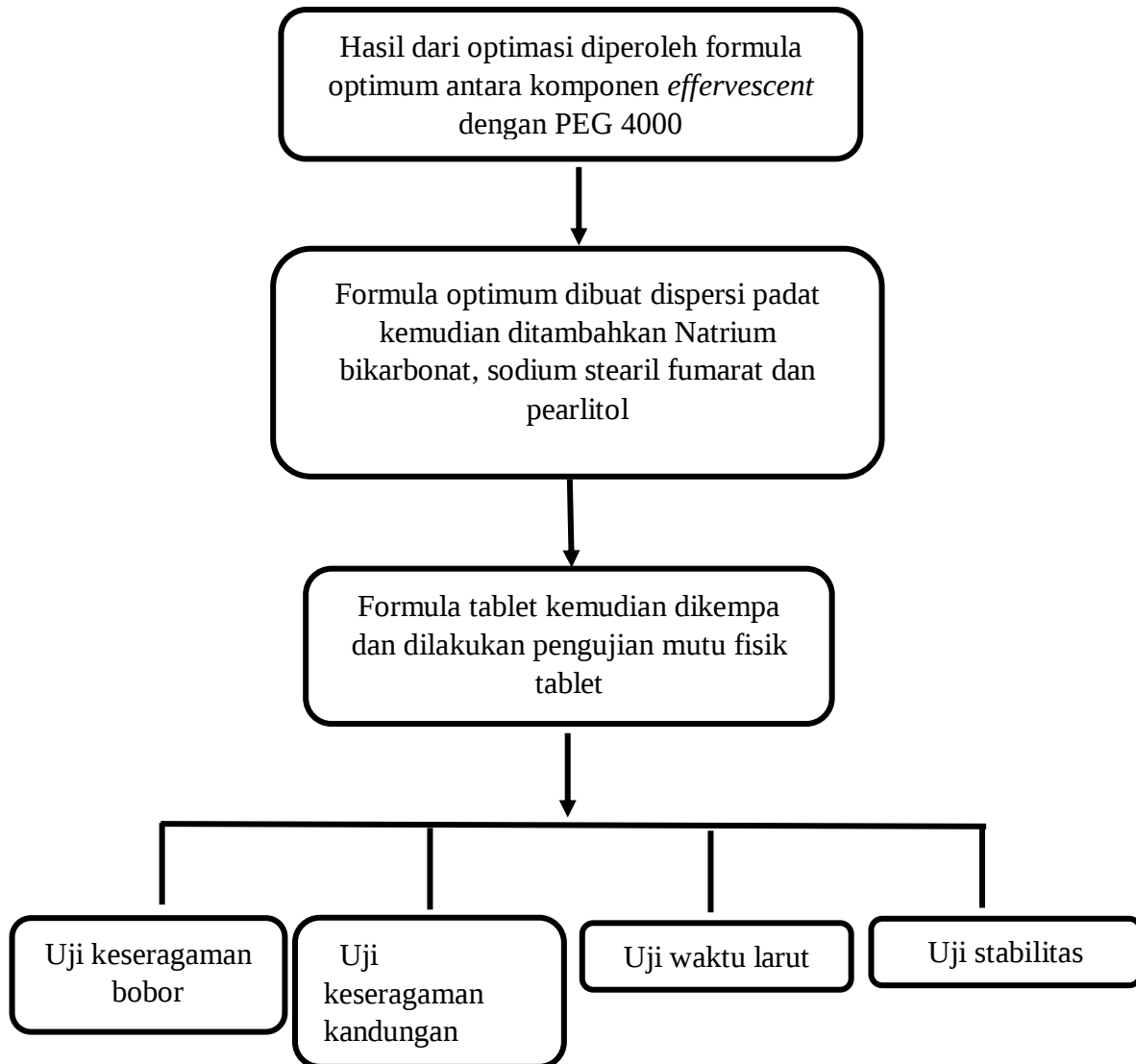
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Lampiran 1. Pembuatan granul dispersi asam sitrat dan meloksikam dengan PEG 4000



Lampiran 2. Pengujian mutu fisik granul dan optimasi dispersi padat

Lampiran 3. Pembuatan tablet *effervescent* meloksikam

Lampiran 4. Pemeriksaan kualitas granul

a. Uji kelembapan

	Kelembapan Hari 1 (%)	Kelembapan Hari 2 (%)	rata rata % hari ke 1	rata rata % hari ke 2	selisih	peningkatan kelembapan (%)
F1 rep 1	1,5	2,0			0,5	33,33
rep 2	1,5	2,0	1,5	2,0	0,5	33,33
rep 3	1,5	2,0			0,5	33,33
F2 rep 1	1,8	4,8			3,0	166,67
rep 2	1,8	4,8	1,8	4,8	3,0	166,67
rep 3	1,7	4,8			3,1	182,35
F3 rep 1	1,5	5,0			3,5	233,33
rep 2	1,5	5,0	1,5	5,4	3,5	233,33
rep 3	1,5	6,3			4,8	320,00
F4 rep 1	2,0	4,0			2,0	100,00
rep 2	2,0	3,9	2,0	3,9	1,9	95,00
rep 3	1,9	3,9			2,0	105,26

b. Uji stabilitas Suhu dingin

Waktu (jam)	Formula 1		Formula 2	
	Berat sampel	Bobot kenaikan	Berat sampel	Bobot kenaikan
0	17,803	0,000	28,6704	0,000
1	17,8043	0,001	28,6721	0,002
2	17,805	0,002	28,6738	0,003
3	17,8058	0,003	28,6746	0,004
24	17,8093	0,006	28,6819	0,011
48	17,8135	0,011	28,6888	0,018

Waktu (jam)	Formula 3		Formula 4	
	Berat sampel	Bobot kenaikan	Berat sampel	Bobot kenaikan
0	24,3371	0,000	15,4653	0,000
1	24,3383	0,0012	15,4754	0,010
2	24,3395	0,0024	15,4805	0,015
3	24,3405	0,0034	15,4849	0,020
24	24,3438	0,0067	15,4875	0,022
48	24,3459	0,0088	15,4958	0,030

Berat asam sitrat

Formula 1 dan formula 3			
Waktu (jam)	Berat asam tunggal	Bobot kenaikan	Berat asam teoritis
0	3,2605	0,0000	2,9812
1	3,2614	0,0009	2,9820
2	3,2623	0,0018	2,9828
3	3,2628	0,0023	2,9833
24	3,2633	0,0028	2,9837
48	3,2639	0,0034	2,9843

Formula 2 dan formula 4			
Waktu (jam)	Berat asam tunggal	Bobot kenaikan	Berat asam teoritis
0	5,4305	0,0000	4,9653
1	5,4309	0,0004	4,9656
2	5,4318	0,0013	4,9664
3	5,4329	0,0024	4,9674
24	5,434	0,0035	4,9685
48	5,4353	0,0048	4,9696

Suhu ruang

Waktu (jam)	Formula 1		Formula 2	
	Berat sampel	Bobot kenaikan	Berat sampel	Bobot kenaikan
0	17,8002	0,000	28,6703	0,000
1	17,8022	0,002	28,6743	0,004
2	17,8052	0,005	28,6763	0,006
3	17,8062	0,006	28,6773	0,007
24	17,8202	0,020	28,6973	0,027
48	17,8502	0,050	28,7463	0,076

Waktu (jam)	Formula 3		Formula 4	
	Berat sampel	Bobot kenaikan	Berat sampel	Bobot kenaikan
0	24,3302	0,000	39,5403	0,000
1	24,3332	0,0030	39,5463	0,006
2	24,3362	0,0060	39,5483	0,008
3	24,3372	0,0070	39,5493	0,009
24	24,3512	0,0210	39,5673	0,027
48	24,3852	0,0550	39,6073	0,067

Berat asam sitrat

Formula 1 dan formula 3			
Waktu (jam)	Berat asam tunggal	Bobot kenaikan	Berat asam teoritis
0	3,2605	0,0000	2,9812
1	3,2615	0,0010	2,9821
2	3,2635	0,0030	2,9839
3	3,2635	0,0030	2,9839
24	3,2635	0,0030	2,9839
48	3,2665	0,0060	2,9866

Formula 2 dan formula 4			
Waktu (jam)	Berat asam tunggal	Bobot kenaikan	Berat asam teoritis
0	5,4306	0,0000	4,9653
1	5,4326	0,0020	4,9672
2	5,4346	0,0040	4,9690
3	5,4346	0,0040	4,9690
24	5,4356	0,0050	4,9699
48	5,4375	0,0069	4,9717

(% Kenaikan suhu dingin

Waktu	Kenaikan bobot terhadap asam teoritis pada suhu dingin (%)			
	F1	F2	F3	F4
0	0,00	0,00	0,00	0,00
1	0,04	0,03	0,04	0,03
2	0,07	0,07	0,08	0,06
3	0,09	0,08	0,11	0,08
24	0,21	0,23	0,22	0,19
48	0,35	0,37	0,29	0,25

Waktu	Kenaikan bobot terhadap asam tunggal pada suhu ac (%)			
	F1	F2	F3	F4
0	0,00	0,00	0,00	0,00
1	0,04	0,03	0,04	0,03
2	0,06	0,06	0,07	0,05
3	0,09	0,08	0,10	0,07
24	0,19	0,21	0,21	0,17
48	0,32	0,34	0,27	0,23

(%) Kenaikan suhu ruang

Waktu	Kenaikan bobot terhadap asam teoritis pada suhu ruang (%)			
	F1	F2	F3	F4
0	0,00	0,00	0,00	0,00
1	0,07	0,08	0,10	0,12
2	0,17	0,12	0,20	0,16
3	0,20	0,14	0,23	0,18
24	0,67	0,54	0,70	0,54
48	1,67	1,53	1,84	1,35

Waktu	Kenaikan bobot terhadap asam teoritis pada suhu ruang (%)			
	F1	F2	F3	F4
0	0,00	0,00	0,00	0,00
1	0,06	0,07	0,09	0,11
2	0,15	0,11	0,18	0,15
3	0,18	0,13	0,21	0,17
24	0,61	0,50	0,64	0,50
48	1,53	1,40	1,68	1,23

Keterangan :

Bobot kenaikan = bobot jam ke x – bobot jam ke 0

Persen kenaikan bobot terhadap asam teoritis = $\frac{\text{bobot sampel jam ke x}}{\text{bobot asam teoritis jam x}} \times 100\%$

Bobot asam sitrat teoritis jam x = $\frac{192,1}{210,1} \times \text{bobot asam tunggal jam x}$

BM asam sitrat anhidrat = 192,1

BM asam sitrat monohidrat = 210,1

Bobot asam sitrat tunggal adalah bobot asam sitrat yang diperoleh selama uji stabilitas

Lampiran 5. Uji disolusi

a. *Disolution Efficiency* (DE15)

waktu	Area Under Curve (AUC)					
	F1			F2		
	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
1	8,431905	7,532401	6,99246	5,323378	6,421392	6,301379
2	18,0596	17,10713	16,84038	10,61378	10,6697	10,34944
3	34,94393	35,69885	35,25744	23,12327	23,19952	22,55746
5	96,76923	95,93415	94,61233	70,50654	73,4054	73,53934
10	246,2901	246,005	243,2015	225,8401	221,7292	226,1462
15	249,7099	255,2202	253,4606	271,4676	265,0216	268,5932
30	387,1426	389,3687	389,1182	425,5791	428,911	433,1114
TOTAL	654,2046	657,4977	650,3647	606,8746	600,4468	607,487
DE15	43,61364	43,83318	43,35764	40,45831	40,02978	40,49914
AUC total	1041,347	1046,866	1039,483	1032,454	1029,358	1040,598

Waktu	Area Under Curve (AUC)					
	F3			F4		
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3
1	8,375076	9,366414	7,563075	4,385861	6,400799	7,807186
2	15,34407	17,4543	15,17259	9,436687	10,31199	11,35972
3	25,67483	26,41403	25,67355	26,69443	25,29461	27,14149
5	75,14032	74,49514	75,82583	87,93106	86,47806	86,50957
10	235,175	231,2498	233,9483	247,8466	254,512	243,5598
15	263,9969	260,79	261,1338	256,6528	263,5884	260,6846
30	417,5074	417,9403	414,187	390,4341	392,5217	394,7505
TOTAL	623,7062	619,7697	619,3172	632,9474	646,5859	637,0624
DE15	41,58041	41,31798	41,28782	42,1965	43,10573	42,47083
AUC total	1041,214	1037,71	1033,504	1023,382	1039,108	1031,813

% terdisolusi formula optimum

Waktu (menit)	Jumlah (%) terdisolusi			
	Rep 1	Rep 2	Rep 3	Rata-rata
1	4,26	6,29	5,26	5,27
2	11,60	13,28	12,73	12,54
3	22,17	22,38	22,57	22,38
5	30,62	42,27	40,72	37,87
10	47,83	45,80	47,64	47,09
15	50,96	50,53	50,64	50,71
30	53,38	53,15	52,39	52,97

Dissolusi efficiency (DE15) Formula optimum

Waktu (menit)	Area Under Curve (AUC)		
	rep 1	rep 2	rep 3
1	7,931203	9,786747	8,993553
2	16,8881	17,83164	17,65136
3	26,39943	32,3264	31,64694
5	78,45257	88,07497	88,35909
10	246,9748	240,8307	245,6946
15	260,8524	259,19	257,5817
30	400,3424	398,6017	392,9308
TOTAL	637,4985	648,0405	649,9273
DE15	42,4999	43,2027	43,32849
AUC total	1037,841	1046,642	1042,858

Contoh perhitungan disolusi

Waktu	Absorbansi		Kadar meloksikam	FP	konsentrasi		kons. (mg/L)	Vol. medium (L)	jumlah obat (mg)	koreksi (mg)	Total kor. (mg)	jumlah obat total terdisolusi	% terdisolusi
	rep 1	rep 2			rep 1	rep 2							
1	0,028	0,024	15,477	1	0,737	0,678	0,708	0,9	0,64	0,00	0,00	0,64	4,11
2	0,109	0,143	15,477	1	1,934	2,436	2,185	0,9	1,97	0,01	0,01	1,97	2,75
3	0,25	0,246	15,477	1	4,016	3,957	3,957	0,9	3,59	0,02	0,03	3,62	23,37
5	0,514	0,515	15,477	1	7,916	7,931	7,923	0,9	7,13	0,04	0,07	7,20	46,52
10	0,555	0,549	15,477	1	8,521	8,433	8,477	0,9	7,63	0,08	0,15	7,78	50,25
15	0,522	0,523	15,477	1	8,034	8,049	8,041	0,9	7,24	0,08	0,23	7,47	48,26
30	0,565	0,546	15,477	1	8,669	8,388	8,529	0,9	7,68	0,08	0,31	7,99	51,62

Kadar meloksikam yang dihitung menggunakan persamaan kurva baku

$$\text{Konsentrasi} : \frac{(X+0,0219)}{0,0677}$$

Jumlah obat terdisolusi (mg) : konsentrasi x Volume medium disolusi

$$\text{Koreksi} : \frac{\text{vol. sampling}}{\text{volume medium disolusi}} \times \text{jumlah obat}_{n-1}$$

Total koreksi : total koreksi_{n-1} + koreksi

Total jumlah obat terdisolusi : jumlah obat terdisolusi + total koreksi

$$\% \text{terdisolusi} : \frac{\text{total jumlah obat terdisolusi}}{\text{kadar meloksikam}} \times 100\%$$

Perhitungan DE15

$$\text{DE15} : \frac{\text{Luas AUC total (sampai menit ke 15)}}{\text{luas total}} \times 100$$

$$\text{AUC 30-15} : \frac{(t_{30}-t_{15}) \times (\% \text{terdisolusi Menit 15} + \% \text{terdisolusi menit ke 30})}{2}$$

c. Penetapan kadar

Formula 1

Replikasi	Abs	Volume pembuatan	Pengenceran	Kadar (ppm)	Kadar (mg)
1	0,547	100	20	8,403	16,806
2	0,474	100	20	7,325	14,650
3	0,485	100	20	7,487	14,975
rata-rata					15,477
SD					1,163
RSD					7,512

Formula 2

Replikasi	Abs	Volume pembuatan	Pengenceran	Kadar (ppm)	Kadar (mg)
1	0,53	100	20	8,152	16,304
2	0,528	100	20	8,123	16,245
3	0,573	100	20	8,787	17,575
				rata-rata	16,708
				SD	0,751
				RSD	4,495

Formula 3

Replikasi	Abs	Volume pembuatan	Pengenceran	Kadar (ppm)	Kadar (mg)
1	0,465	100	20	8,669	17,338
2	0,6	100	20	9,186	18,372
3	0,579	100	20	8,876	17,752
				Rata-rata	17,821
				SD	0,520
				RSD	2,920

Formula 4

Replikasi	Abs	Volume pembuatan	Pengenceran	Kadar (ppm)	Kadar (mg)
1	0,525	100	20	8,078	16,157
2	0,548	100	20	8,418	16,836
3	0,575	100	20	8,817	17,634
				Rata-rata	16,875
				SD	0,739
				RSD	4,381

Formula Optimum

Replikasi	Abs	Volume pembuatan	Pengenceran	Kadar (ppm)	Kadar (mg)
1	0,51	100	20	7,857	15,713
2	0,52	100	20	8,004	16,009
3	0,533	100	20	8,196	16,393
				Rata-rata	16,038
				SD	0,341
				RSD	2,124

d. Peningkatan kelarutan

REP	PENINGKATAN KELARUTAN (%)				
	F1	F2	F3	F4	OPTIMUM
1	134,760	133,609	134,743	132,435	134,760
2	135,474	133,208	134,289	134,470	135,474
3	134,519	134,663	133,745	133,526	134,519
Rata - rata	134,92	133,83	134,26	133,48	134,92
SD	0,50	0,75	0,50	1,02	0,50
RSD	0,37	0,56	0,37	0,76	0,37

Keterangan :

$$\text{Kadar (ppm)} : \frac{(abs-0,0219)}{0,0677}$$

$$\text{Kadar (mg)} : \frac{(\text{kadar (ppm)} \times \text{pengenceran}) \times \text{volume pembuatan}}{1000}$$

Perhitungan peningkatan kelarutan :

$$\text{Peningkatan kelarutan} : \frac{AUC \text{ sampel}}{AUC \text{ meloksikam}} \times 100\%$$

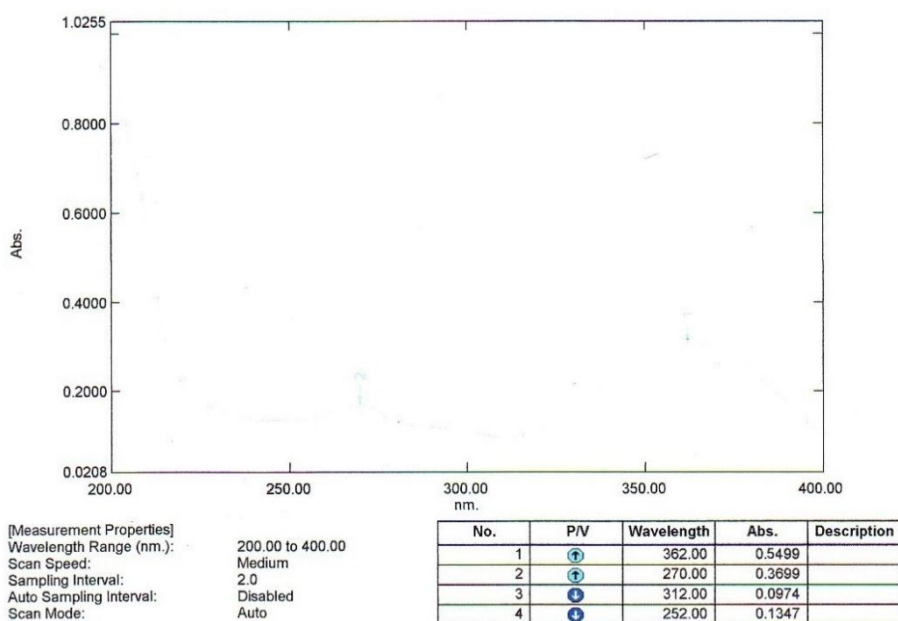
Lampiran 6. Penentuan panjang gelombang, kurva kalibrasi dan validasi metode

a. Penentuan panjang gelombang

Spectrum Peak Pick Report

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Data Set: meloksikam_122935 - RawData



b. Kurva kalibrasi

konsentrasi (ppm)	Volume	Pengencer	Pengenceran	Kadar	Rep 1	Rep 2	Rep 3	Rep 4	rata- rata
2	200	10000	51	1,96	0,094	0,095	0,144	0,144	0,1193
4	400	10000	26	3,85	0,228	0,228	0,225	0,225	0,2265
6	600	10000	17,67	5,66	0,363	0,366	0,368	0,367	0,366
8	800	10000	13,50	7,41	0,479	0,479	0,468	0,470	0,474
12	1200	10000	9,33	10,71	0,710	0,711	0,703	0,704	0,707

$$y = 0,0677x - 0,0219$$

$$r^2 = 0,9986$$

keterangan : x = konsentrasi (ppm)

y = serapan (absorbansi)

c. Presisi dan akurasi

Akurasi

Konsentras i	Replikas i	Abs	Konsentras i	Sebenarny a	% <i>Recover</i> <i>y</i>	Rata- rata	Akurasi
80%	1	0,35 6	6,0187	6,4	94%	94,92%	
	2	0,36 3	6,1370	6,4	96%		
	3	0,35 9	6,0694	6,4	95%		
100%	1	0,46 8	7,9117	8	99%	98,54%	98,85%
	2	0,46 6	7,8779	8	98%		
	3	0,46 5	7,8610	8	98%		
120%	1	0,59 2	10,0074	9,6	104%	103,07 %	
	2	0,58 6	9,9060	9,6	103%		
	3	0,57 8	9,7708	9,6	102%		

Presisi

Replikasi	Abs	Konsentrasi
1	0,486	8,2159
2	0,477	8,0638
3	0,484	8,1821
4	0,474	8,0131
5	0,479	8,0976
6	0,470	7,9455
7	0,479	8,0976
8	0,492	8,3173
9	0,497	8,4018
10	0,483	8,1652
SD	0,137641938	
Mean	8,08630344	
CV / RSD	0,017021614	

Keterangan :

Akurasi

80% : $80 \% \times 8 \mu\text{g/mL} : 6,4 \mu\text{g/mL}$

100% : $100 \% \times 8 \mu\text{g/mL} : 8 \mu\text{g/mL}$

120% : $120 \% \times 8 \mu\text{g/mL} : 9,6 \mu\text{g/mL}$

Konsentrasi : $(\text{abs} - (-0,0001))/0.0592)$

% recovery : $\frac{\text{konsentrasi}}{\text{konsentrasi sebenarnya}} \times 100\%$

Lampiran 7. Uji mutu fisik tablet

a. Keseragaman sediaan

Keseragaman kandungan

Replikasi	abs	volume pembuatan	pengenceran	kadar (ppm)	kadar (mg)	bobot tablet	kandungan (mg)	kandungan (%)
1	0,517	100	20	7,96	15,92	485	16,43	103,19
2	0,536	100	20	8,24	16,48	478	16,76	101,70
3	0,556	100	20	8,54	17,07	478	17,36	101,70
4	0,595	100	20	9,11	18,22	483	18,73	102,77
5	0,579	100	20	8,88	17,75	478	18,05	101,70
6	0,529	100	20	8,14	16,27	478	16,55	101,70
7	0,532	100	20	8,18	16,36	479	16,68	101,91
8	0,546	100	20	8,06	16,13	483	16,58	102,77
9	0,527	100	20	8,11	16,22	474	16,35	100,85
10	0,577	100	20	8,85	17,69	479	18,03	101,91
Mean							17,15	102,02
SD							0,83986233 2	0,6894405
RSD							4,89641969 9	0,675781095

Keterangan :

$$\text{Kadar (ppm)} : \frac{(abs - 0,0219)}{0,0677}$$

$$\text{Kadar (mg)} : \frac{(\text{kadar (ppm)} \times \text{pengenceran}) \times \text{volume pembuatan}}{1000}$$

$$\text{Kandungan meloksikam dalam tablet (mg)} : \frac{\text{bobot tablet}}{\text{bobot sampel}} \times \text{kadar, bobot sampel} = 470 \text{ mg}$$

$$\% \text{ kandungan meloksikam} : \frac{\text{bobot tablet}}{\text{bobot sampel}} \times 100\%$$

Keseragaman bobot

Replikasi	Bobot tablet
1	492
2	490
3	491
4	492
5	489
6	489
7	489
8	488
9	486
10	487
Rata-rata	489,3
SD	2,002775851
RSD	0,409314501

b. Waktu larut

waktu larut	
Rep	Waktu
1	5,10
2	5,11
3	5,15
rata-rata	5,12
SD	0,0265
RSD	0,5168

c. Stabilitas tablet

replikasi 1			
waktu	bobot tablet (mg)	kenaikan bobot (mg)	% kenaikan bobot
0	478	0	0
1	478	0	0
2	478	0	0
3	478	0	0
4	478	0	0
24	480	2	0,418
48	482	4	0,837

replikasi 2			
waktu	bobot tablet (mg)	kenaikan bobot (mg)	persen kenaikan bobot
0	489	0	0
1	492	3	0,614
2	492	3	0,614
3	492	3	0,614
4	492	3	0,614
24	492	3	0,614
48	493	4	0,818

replikasi 3			
waktu	bobot tablet (mg)	kenaikan bobot (mg)	kenaikan bobot (%)
0	492	0	0
1	492	0	0
2	493	1	0,203
3	493	1	0,203
4	493	1	0,203
24	494	2	0,407
48	496	4	0,813

Keterangan :

Kenaikan bobot : bobot tablet jam (n) – bobot tablet jam 0

Persen kenaikan bobot : $\frac{\text{bobot tablet jam (n)} - \text{bobot tablet jam 0}}{\text{bobot jam 0}} \times 100\%$

Lampiran 8. Optimasi dengan *factorial design*

a. Peningkatan kelembapan

Transform

y^λ Transform  Effects  ANOVA  Diagnostics  Model Graphs

To analyze this response, click on the above icons in succession.

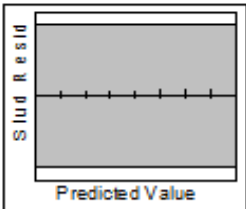
Transformation

- None
- Square root
- Natural log
- Base 10 log
- Inverse sqrt
- Inverse
- Power
- Logit
- ArcSin sqrt

Equation

None (lambda = 1.0)

$y' = y$



Use with a typical response.

Response ranges from 33.3333 to 320.
Ratio of max to min is 9.6

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Effect list

y^λ Transform  Effects  ANOVA  Diagnostics  Model Graphs

Selection: **Manual** Order: **2FI**

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-PEG 4000	78.54	18505.76	20.12
M	B-ASAM SITRAT	-11.79	416.73	0.45
M	AB	-150.35	67813.84	73.74
e	Lack Of Fit		0.000	0.000
e	Pure Error		5224.16	5.68
	Lenth's ME	94.24		
	Lenth's SME	121.77		

Anova

ANOVA for selected factorial model					
Analysis of variance table [Partial sum of squares - Type III]					
Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F
Model	86736.33	3	28912.11	44.27	< 0.0001
A-PEG 4000	18505.76	1	18505.76	28.34	0.0007
B-ASAM SITR	416.73	1	416.73	0.64	0.4474
AB	67813.84	1	67813.84	103.85	< 0.0001
Pure Error	5224.16	8	653.02		
Cor Total	91960.49	11			

Std. Dev.	25.55	R-Squared	0.9432
Mean	141.88	Adj R-Squared	0.9219
C.V. %	18.01	Pred R-Squared	0.8722
PRESS	11754.35	Adeq Precision	15.514

Final Equation in Terms of Coded Factors:

$$\begin{aligned}
 \text{Peningkatan kelembapan} = & \\
 & +141.88 \\
 & +39.27 * A \\
 & -5.89 * B \\
 & -75.17 * A * B
 \end{aligned}$$

b. DE₁₅

Transform

y[^] Transform
Effects
ANOVA
Diagnostics
Model Graphs

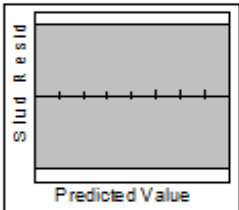
To analyze this response, click on the above icons in succession.

Transformation

- None
- Square root
- Natural log
- Base 10 log
- Inverse sqrt
- Inverse
- Power
- Logit
- ArcSin sqrt

Equation

None (lambda = 1.0)

$$y' = y$$


Use with a typical response.

Response ranges from 40.0298 to 43.8332.
Ratio of max to min is 1.09501

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Effect list

y[^] Transform
Effects
ANOVA
Diagnostics
Model Graphs

Selection: Manual
 Order: 2FI

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-PEG 4000	0.028	2.340E-003	0.012
M	B-ASAM SITRAT	-1.04	3.23	17.07
M	AB	2.23	14.97	79.03
e	Lack Of Fit		0.000	0.000
e	Pure Error		0.74	3.88
	Lenth's ME	1.23		
	Lenth's SME	1.59		

Anova

Response 3 DE15

ANOVA for selected factorial model

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

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	18.21	3	6.07	66.04	< 0.0001	significant
<i>A-PEG 4000</i>	<i>2.340E-003</i>	<i>1</i>	<i>2.340E-003</i>	<i>0.025</i>	<i>0.8772</i>	
<i>B-ASAM SITR</i>	<i>3.23</i>	<i>1</i>	<i>3.23</i>	<i>35.19</i>	<i>0.0003</i>	
<i>AB</i>	<i>14.97</i>	<i>1</i>	<i>14.97</i>	<i>162.90</i>	<i>< 0.0001</i>	
Pure Error	0.74	8	0.092			
Cor Total	18.94	11				
Std. Dev.	0.30		R-Squared		0.9612	
Mean	41.98		Adj R-Squared		0.9466	
C.V. %	0.72		Pred R-Squared		0.9127	
PRESS	1.65		Adeq Precision		18.696	

Final Equation in Terms of Coded Factors:

$$\begin{aligned}
 \text{DE15} = & \\
 & +41.98 \\
 & +0.014 * A \\
 & -0.52 * B \\
 & +1.12 * A * B
 \end{aligned}$$

c. Q_3

Transform

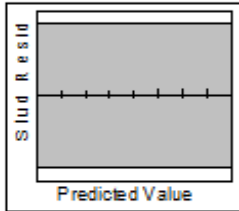
Transform | **Effects** | **ANOVA** | **Diagnostics** | **Model Graphs**

To analyze this response, click on the above icons in succession.

Transformation
 None
 Square root
 Natural log
 Base 10 log
 Inverse sqrt
 Inverse
 Power
 Logit
 ArcSin sqrt

Equation

None (lambda = 1.0)

$$y' = y$$


Use with a typical response.

Response ranges from 12.345 to 23.6933.
 Ratio of max to min is 1.91927

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Effect list

Transform | **Effects** | **ANOVA** | **Diagnostics** | **Model Graphs**

Selection: **Manual** | Order: **2FI**

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-PEG 4000	-1.23	4.51	1.77
M	B-ASAM SITRAT	-8.90	237.61	93.18
M	AB	1.53	7.06	2.77
e	Lack Of Fit		0.000	0.000
e	Pure Error		5.82	2.28
	Lenth's ME	1.88		
	Lenth's SME	2.43		

Anova

Response 1 Q3

ANOVA for selected factorial model

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

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	249.18	3	83.06	114.16	< 0.0001	significant
A-PEG 4000	4.51	1	4.51	6.20	0.0375	
B-ASAM SITR ₀	237.61	1	237.61	326.57	< 0.0001	
AB	7.06	1	7.06	9.71	0.0143	
Pure Error	5.82	8	0.73			
Cor Total	255.00	11				

Std. Dev.	0.85	R-Squared	0.9772
Mean	17.75	Adj R-Squared	0.9686
C.V. %	4.81	Pred R-Squared	0.9486
PRESS	13.10	Adeq Precision	21.187

Final Equation in Terms of Coded Factors:

$$\begin{aligned}
 Q3 = & \\
 & +17.75 \\
 & -0.61 * A \\
 & -4.45 * B \\
 & +0.77 * A * B
 \end{aligned}$$

d. Peningkatan kelarutan

Transform

y[^] Transform  Effects  ANOVA  Diagnostics  Model Graphs

To analyze this response, click on the above icons in succession.

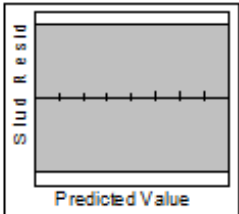
Transformation

- None
- Square root
- Natural log
- Base 10 log
- Inverse sqrt
- Inverse
- Power
- Logit
- ArcSin sqrt

Equation

None (lambda = 1.0)

$y' = y$



Use with a typical response.

Response ranges from 133.208 to 135.474.
Ratio of max to min is 1.01701

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

Effect list

y[^] Transform  Effects  ANOVA  Diagnostics  Model Graphs

Selection: **Manual** Order: **2FI**

	Term	Stdized Effects	Sum of Squares	% Contribution
	Intercept			
M	A-PEG 4000	-0.42	0.53	8.67
M	B-ASAM SITRAT	-1.19	4.22	68.85
M	AB	0.40	0.49	8.00
e	Lack Of Fit		0.000	0.000
e	Pure Error		0.89	14.48
	Lenth's ME	0.63		
	Lenth's SME	0.81		

Anova

Response 4 PKELARUTAN

ANOVA for selected factorial model

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

Source	Sum of Squares	df	Mean Square	F Value	p-value Prob > F	
Model	5.25	3	1.75	15.75	0.0010	significant
<i>A-PEG 4000</i>	<i>0.53</i>	<i>1</i>	<i>0.53</i>	<i>4.79</i>	<i>0.0601</i>	
<i>B-ASAM SITR</i>	<i>4.22</i>	<i>1</i>	<i>4.22</i>	<i>38.04</i>	<i>0.0003</i>	
<i>AB</i>	<i>0.49</i>	<i>1</i>	<i>0.49</i>	<i>4.42</i>	<i>0.0687</i>	
Pure Error	0.89	8	0.11			
Cor Total	6.13	11				
Std. Dev.	0.33		R-Squared	0.8552		
Mean	134.08		Adj R-Squared	0.8009		
C.V. %	0.25		Pred R-Squared	0.6742		
PRESS	2.00		Adeq Precision	8.356		

Final Equation in Terms of Coded Factors:

$$\begin{aligned}
 \text{PKELARUTAN} = & \\
 & +134.08 \\
 & -0.21 * A \\
 & -0.59 * B \\
 & +0.20 * A * B
 \end{aligned}$$

Lampiran 9. Penentuan formula optimum

Name	Goal	Lower Limit	Upper Limit	Lower Weight	Upper Weight	Importance
PEG 4000	is in range	4	6	1	1	3
ASAM SITRAT	is in range	15	25	1	1	3
Q3	maximize	20	23.6933	1	1	3
PKELEMBAPAN	minimize	33.3333	320	1	1	3
DE15	maximize	40.0298	43.8332	1	1	3
PKELARUTAN	maximize	133.208	135.474	1	1	3

Solutions							
Number	PEG 4000	ASAM SITRAT	Q3	PKELEMBAPAN	DE15	PKELARUTAN	Desirability
1	<u>4.00</u>	<u>15.00</u>	<u>23.5814</u>	<u>33.3333</u>	<u>43.6015</u>	<u>135.084</u>	<u>0.932</u>

Selected

1 Solutions found

Lampiran 10. Verifikasi formula optimum

a. Peningkatan kelembapan

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
HASILKELEMBAPAN	2	33,8100	,67882	33,33	34,29

One-Sample Kolmogorov-Smirnov Test

		HASILKELEM BAPAN
N		2
Normal Parameters ^{a,b}	Mean	33,8100
	Std. Deviation	,67882
Most Extreme Differences	Absolute	,260
	Positive	,260
	Negative	-,260
Kolmogorov-Smirnov Z		,368
Asymp. Sig. (2-tailed)		,999

a. Test distribution is Normal.

b. Calculated from data.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HASILKELEMBAPAN	2	33,8100	,67882	,48000

One-Sample Test

	Test Value = 33.33					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HASILKELEMBAPAN	1,000	1	,500	,48000	-5,6190	6,5790

b. DE15

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
HASIL DE15	2	43,3058	,41825	43,01	43,60

One-Sample Kolmogorov-Smirnov Test

		HASIL DE15
N		2
Normal Parameters ^{a,b}	Mean	43,3058
	Std. Deviation	,41825
Most Extreme Differences	Absolute	,260
	Positive	,260
	Negative	-,260
Kolmogorov-Smirnov Z		,368
Asymp. Sig. (2-tailed)		,999

a. Test distribution is Normal.

b. Calculated from data.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HASIL DE15	2	43,3058	,41825	,29575

One-Sample Test

	Test Value = 43.60					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HASIL DE15	-,995	1	,502	-,29425	-4,0521	3,4636

c. Q3

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
HASIL Q3	2	22,9800	,84853	22,38	23,58

One-Sample Kolmogorov-Smirnov Test

			HASIL Q3
N			2
Normal Parameters ^{a,b}	Mean		22,9800
	Std. Deviation		,84853
Most Extreme Differences	Absolute		,260
	Positive		,260
	Negative		-,260
Kolmogorov-Smirnov Z			,368
Asymp. Sig. (2-tailed)			,999

a. Test distribution is Normal.

b. Calculated from data.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HASIL Q3	2	22,9800	,84853	,60000

One-Sample Test

	Test Value = 23.58					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HASIL Q3	-1,000	1	,500	-,60000	-8,2237	7,0237

d. Peningkatan kelarutan

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
HASIL PENINGKATAN KELARUTAN	2	135,0220	,08768	134,96	135,08

One-Sample Kolmogorov-Smirnov Test

		HASIL PENINGKATAN N KELARUTAN
N		2
Normal Parameters ^{a,b}	Mean	135,0220
	Std. Deviation	,08768
Most Extreme Differences	Absolute	,260
	Positive	,260
	Negative	-,260
Kolmogorov-Smirnov Z		,368
Asymp. Sig. (2-tailed)		,999

a. Test distribution is Normal.

b. Calculated from data.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HASIL PENINGKATAN KELARUTAN	2	135,0220	,08768	,06200

One-Sample Test

	Test Value = 135.08					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HASIL PENINGKATAN KELARUTAN	-,935	1	,521	-,05800	-,8458	,7298

Lampiran 11. Certified of analysis (COA)

a. COA Asam sitrat



PT. BRATACO



SERTIFIKAT ANALISIS

Nama Bahan : Acid Citric Anhydrate Import
 No Batch : J 0021/19 (2AX1810026)
 Ex : Weifang Ensign Industry Co., LTD (China)
 E.D : 10/2021
 Grade : Farma

Parameter	Unit	Spesifikasi	Hasil	Metode Tes
Pemerian	-	Hablur, tidak berwarna, tidak berbau, rasa sangat asam, agak hygroskopik, merapuh dalam udara kering dan panas	Sesuai	FI IV
Kelarutan	-	Larut dalam 1 bagian air, 1,5 Bagian etanol, sukar larut dalam eter P	Sesuai	FI IV
Identifikasi	-	Larutan air bereaksi asam, jika dinetralkan menunjukkan reaksi sitrat	Sesuai	FI IV
Oksalat	-	Netralkan 10 ml larutan (1dlm10) dengan NH ₄ OH 6 N, tambahkan 5 tetes HCl 3 N, dinginkan, tambahkan 2 ml CaCl ₂ LP (tidak terjadi kekeruhan)	Sesuai	FI IV
Susut Penguapan	%	≤ 0,5% (Bentuk Anhydrate)	0,11 %	FI IV
Kadar	%	99,5% - 101,0%	100,02 %	FI IV

Kesimpulan : *Memenuhi Syarat*

Cikarang, 11 – 01 – 2019

Pemeriksa

Mutia Noviyanti L.

QC Staff

Penanggung Jawab

Dra. Tri Hartati
 Apoteker
 SIK.3836/B

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 BRANCH OFFICE :
 • JAKARTA : Jl. Mangga Besar V No 5, Jakarta 11180 Telp. (021) 6280113 (hunting 3 lines) Fax. (021) 6292430
 • BANDUNG : Jl. Boulevard Raya Blok T62 No. 5, Jakarta 14240 Telp. (021) 45646692-94 Fax. (021) 4532615
 • SEMARANG : Jl. Krasinsing No. B, Bandung Telp. (022) 6677129, 6030808 Fax. (022) 6031979
 • YOGYA : Jl. Tereben Jakarta No. 773, Bandung Telp. (022) 7107277, 7210308-09 Fax. (022) 7210319
 • SURABAYA : Jl. Bingen, Kotamadya No. 10 Telp. (024) 8415272, 8415999 Fax. (024) 6414980
 • MEDAN : Jl. Bhayangkara No. 45, Yogya Telp. (0274) 543346, 515300 Fax. (0274) 543349
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 The Nationwide Chemicals and Ingredients Distributor

b. COA natrium bikarbonat

PT. BRATACO

SERTIFIKAT ANALISIS

Nama Bahan : Na₂ Bicarbonate
 Batch : J 0228/19 (WWW8303)
 Ex : Church & Dwight Co., Inc. Amerika
 E.P : 10/2021
 Grade : FOOD Grade

Parameter	Unit	Spesifikasi	Hasil	Metode Tes
Pemeriksaan	-	Serbuk putih, stabil di udara kering, dalam udara lembab perlahan-lahan	Sesuai	FI IV
Kelarutan	-	Mudah larut dalam air, tidak larut dalam etanol	Sesuai	FI IV
Identifikasi	-	Menunjukkan reaksi Natrium klorida A dan B dan reaksi Bikarbonat seperti yang tertera pada uji Identifikasi Umum FI ed. IV	Sesuai	FI IV
Suatu Pengeringan	%	≤ Tidak lebih dari 0.25%	0.25	FI IV
pH 1% a/v	-	Tidak lebih dari 8.0	8.479	FI IV
Kadar	%	99.0% - 100.5%	99.13	FI IV

Kesimpulan : Memenuhi Syarat

Caraanq, 10-04-2019

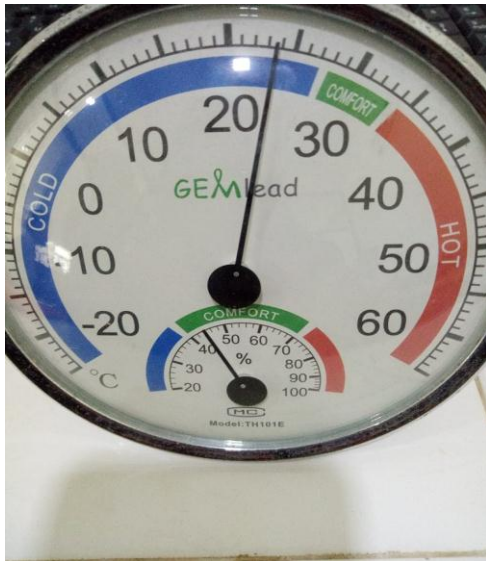
Periksa, 10-04-2019

Pengetik, 

Eni Hartono, S.Si

PT. BRATACO
 Jl. Raya Bontol, No. 10, Bontol, Kabupaten Bontol, Sulawesi Selatan 91111
 Telp. (081) 755 1111, Fax. (081) 755 1112, Email: info@brataco.co.id
 www.brataco.co.id

Lampiran 12. Dokumentasi hasil praktikum



RH pada suhu dingin



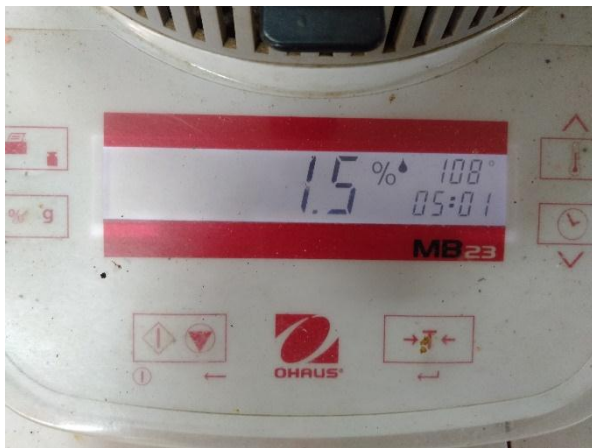
RH pada suhu ruang



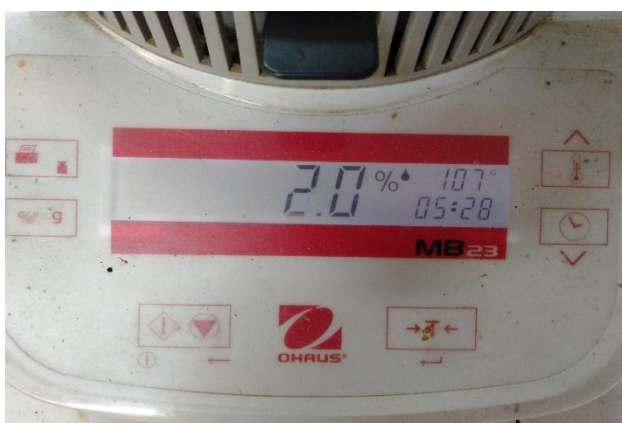
Dispersi padat meloksikam



Granul dispersi padat meloksikam



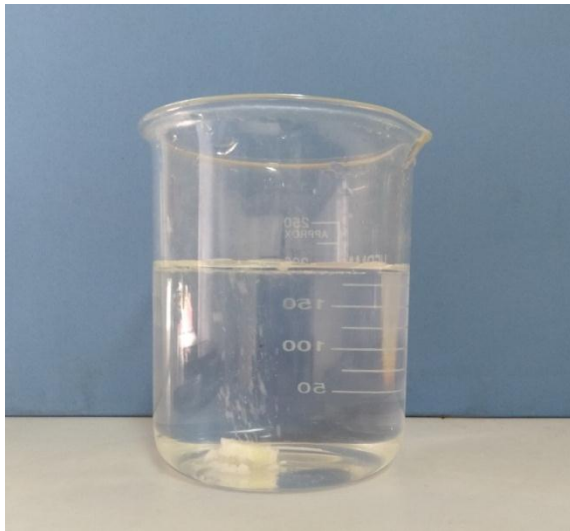
Persen kelembapan formula optimum



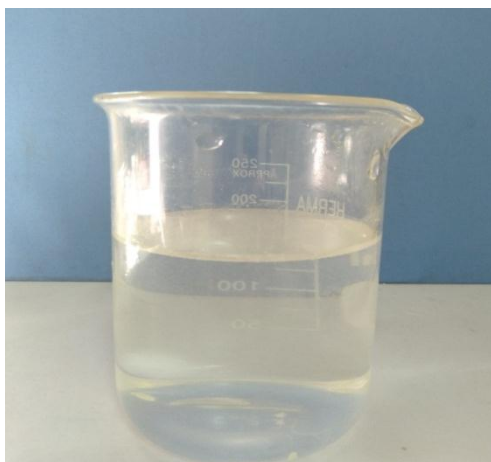
Persen kelembapan formula optimum



Tablet *effervescent* meloksikam



Proses uji waktu larut tablet *effervescent*



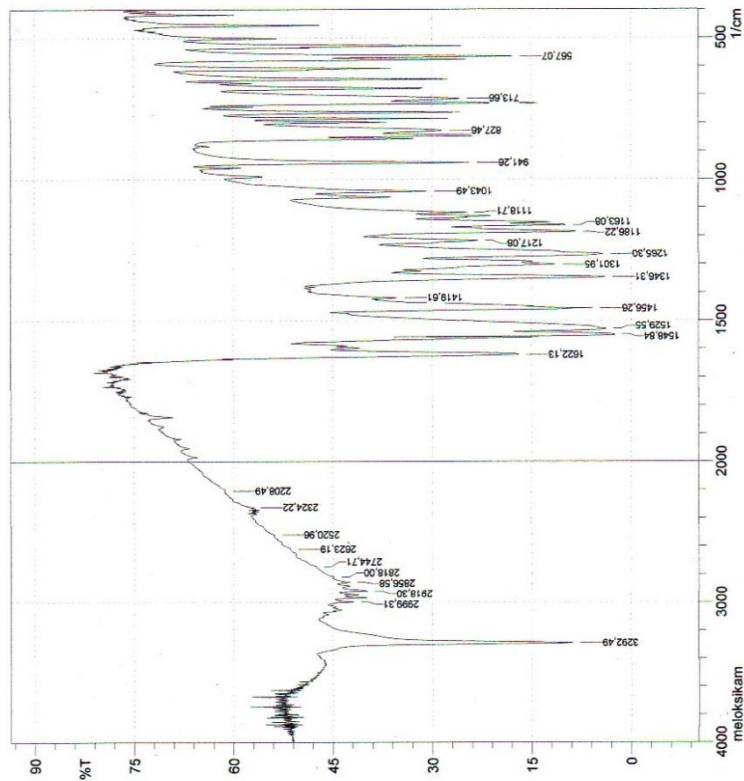
Hasil uji waktu larut tablet *effervescent*

Lampiran 13. Hasil FTIR

a. Spektra FTIR meloksikam

SHIMADZU

Peak	Intensity	Corr. Int	Base (H)	Base (L)	Area	Corr. Area
1	567.07	17.787	30.122	570.93	542	10.016
2	713.66	25.794	15.452	721.38	666.66	13.308
3	827.46	28.534	13.077	835.18	806.25	12.003
4	941.26	24.399	41.535	952.84	896.9	14.828
5	1043.49	30.725	18.606	1051.2	999.13	15.802
6	1118.71	24.669	8.399	1122.57	1074.35	18.201
7	1163.08	9.811	12.673	1168.86	1157.29	9.949
8	1186.22	8.291	25.071	1201.65	1170.79	21.245
9	1217.08	23.039	15.842	1230.58	1203.58	13.909
10	1265.3	4.237	29.215	1280.73	1232.51	39.399
11	1301.95	11.438	9.25	1321.24	1296.16	17.61
12	1346.31	3.899	36.628	1377.17	1330.88	29.556
13	1419.61	35.231	5.158	1423.47	1394.53	10.498
14	1456.26	5.806	37.195	1469.76	1427.32	28.184
15	1529.55	3.73	15.302	1539.2	1477.47	50.178
16	1548.84	2.496	23.275	1558.48	1541.12	21.759
17	1622.13	16.883	38.789	1658.78	1604.77	19.663
18	2208.49	61.143	0.309	2214.28	2133.27	16.712
19	2324.22	57.02	0.646	2330.01	2279.86	11.618
20	2520.96	53.879	0.101	2522.89	2476.6	12.116
21	2623.19	51.408	0.092	2625.12	2584.61	11.485
22	2744.71	47.5	0.128	2746.63	2675.27	22.034
23	2818	44.814	0.482	2823.79	2781.35	14.361
24	2856.58	42.483	2.026	2866.22	2825.72	14.456
25	2918.3	39.834	4.01	2929.87	2897.08	12.361
26	2999.31	41.883	3.257	3018.6	2981.95	13.039
27	3292.49	8.772	37.867	3365.78	3172.9	85.59
28						21.218



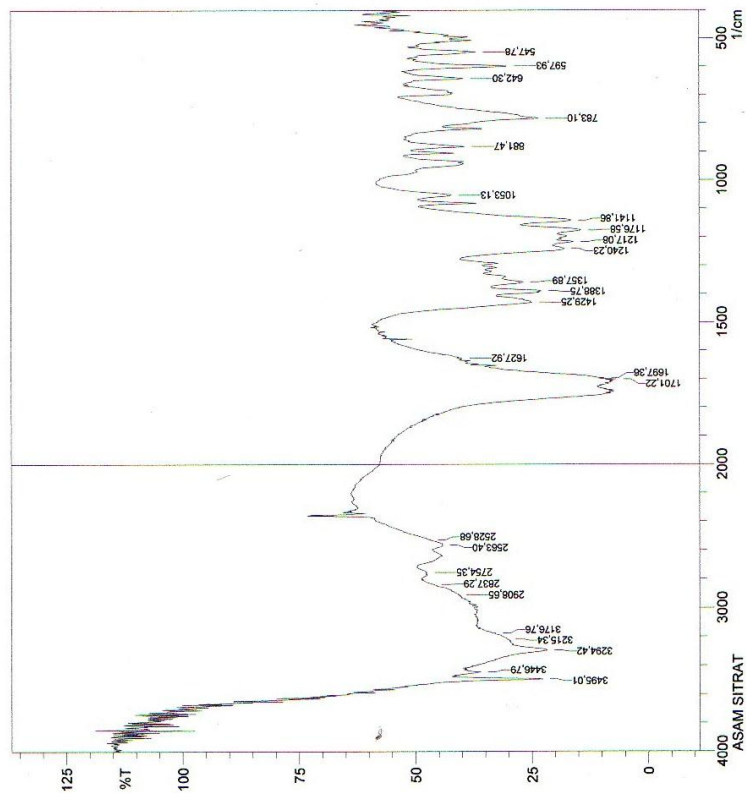
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meloksikam

Date/Time; 04/05/2019 12:31:03
No. of Scans; 10
Resolution; 4 [1/cm]
Apodization; None

b. Spektra FTIR asam sitrat

SHIMADZU

Peak	Intensity	Corr. Inte	Base (H)	Base (L)	Area	Corr. Are
1	547.78	13.37	561.29	532.35	10.51	1.89
2	597.93	20.76	615.29	578.64	13.71	2.97
3	642.3	13.01	661.58	617.22	14.2	1.85
4	783.1	23.53	810.1	707.88	43.04	11.14
5	881.47	39.29	894.97	866.04	9.81	1.34
6	1053.13	42.23	1065.64	1014.56	15.57	1.58
7	1141.86	16.54	1157.29	1093.64	33.2	5.84
8	1176.58	14.4	1190.08	1159.22	22.54	3
9	1217.08	16.03	1228.66	1211.3	12.89	0.72
10	1240.23	18.03	1274.95	1230.58	26.22	2.14
11	1357.89	26.81	1375.25	1346.31	15.24	1.06
12	1388.75	23.02	1404.18	1377.17	15.19	2.26
13	1429.25	24.97	1487.12	1406.11	34.29	4.94
14	1627.92	39.94	1629.85	1573.91	18.12	0.08
15	1697.36	9.42	1699.29	1656.85	28.55	0.34
16	1701.22	6.91	1714.72	1699.29	16.71	1.3
17	2528.68	46.77	2530.61	2434.17	27.9	0.01
18	2563.4	44.15	2598.19	2559.54	12.77	0.15
19	2754.35	47.55	2760.14	2723.49	11.52	0.11
20	2837.29	45.96	2839.22	2808.36	9.99	0.01
21	2908.65	40.7	2912.51	2885.51	10.37	0.08
22	3176.76	32.85	3180.62	3142.04	17.69	0.03
23	3215.34	30.27	3217.27	3180.62	18.42	0.13
24	3294.42	21.8	3332.99	3255.84	45.7	5.09
25	3446.79	36	3468.01	3431.36	15.24	0.79
26	3495.01	22.77	3533.59	3477.66	24.42	5.35



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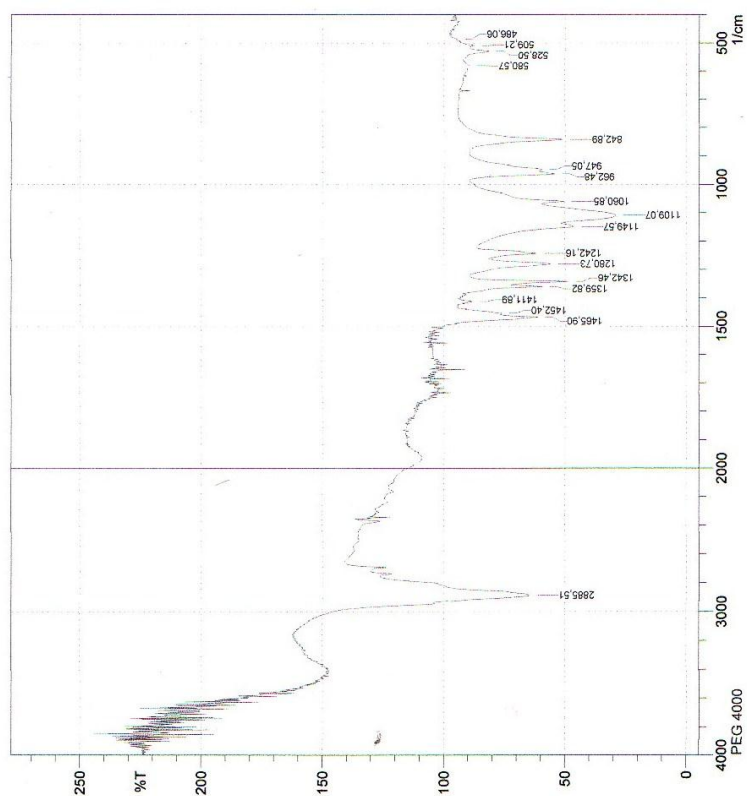
Comment:

ASAM SITRAT

c. Spektra FTIR PEG 4000

SHIMADZU

Peak	Intensity	Corr. Inte	Base (H)	Base (L)	Area	Corr. Are
1	486.06	94.56	1.03	489.92	478.35	0.23
2	505.21	87.53	2.86	513.07	497.63	0.69
3	528.5	81.59	8.62	559.36	516.92	2.35
4	580.57	89.56	0.37	582.5	561.29	0.88
5	842.89	51.19	39.74	881.47	761.88	9.94
6	947.05	59.56	3.18	950.91	893.04	6.26
7	962.48	54.3	15.1	985.62	952.84	5.09
8	1050.85	50.3	12.09	1068.56	987.55	10.02
9	1109.07	29.14	25.49	1136.07	1070.49	26.25
10	1149.57	46.37	9.96	1220.94	1138	13.15
11	1242.16	61.78	22.11	1261.45	1222.87	4.95
12	1280.73	96.02	28.03	1319.31	1263.37	7.21
13	1342.46	48.72	28.5	1352.1	1321.24	4.07
14	1359.82	59.46	16.51	1382.96	1354.03	3.35
15	1411.89	88.31	5.34	1421.54	1404.18	0.71
16	1452.4	76.27	2.16	1454.33	1435.04	1.31
17	1485.9	61.45	19.85	1487.12	1458.18	3.71
18	2885.51	64.8	38.69	2937.59	2810.28	10.01
						11.81



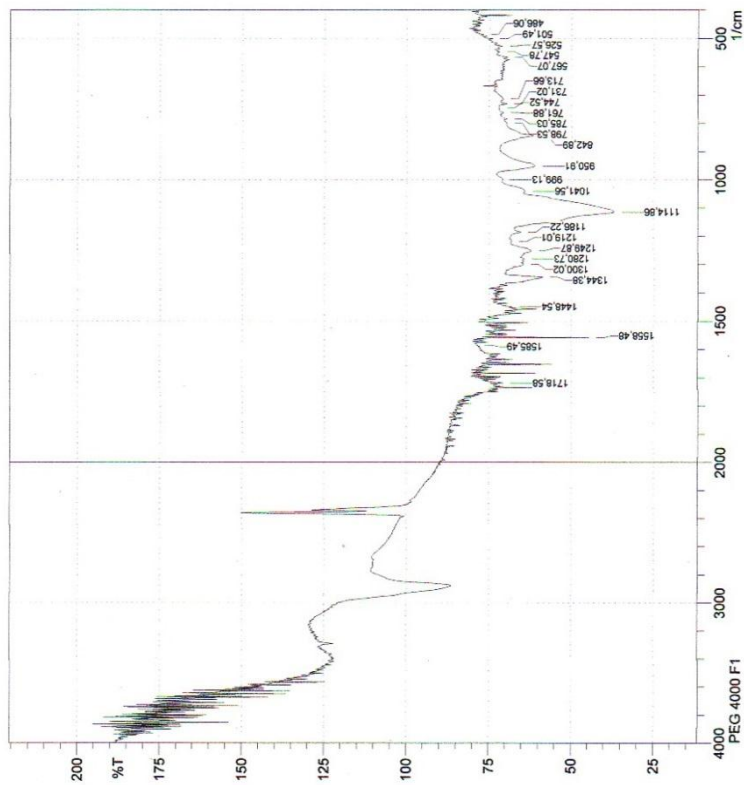
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 Apodization: None

Comment:
 PEG 4000

d. Spektra FTIR formula 1

SHIMADZU

Peak	Intensity	Corr. Int.	Base (H)	Base (L)	Area	Corr. Area
1	486.06	76.81	487.99	476.42	1.21	0.02
2	501.49	73.98	505.35	495.71	1.17	0.03
3	526.57	71.18	532.35	522.71	1.36	0.05
4	547.78	71.84	551.64	542	1.35	0.03
5	567.07	69.37	570.93	559.36	1.71	0.05
6	713.66	70.6	723.31	692.44	4.51	0.13
7	731.02	69.6	736.81	725.23	1.74	0.05
8	744.52	71.72	746.45	738.74	1.11	0.01
9	761.88	70.62	765.74	750.31	2.26	0.03
10	785.03	69.63	788.89	769.6	2.89	0.04
11	798.53	69.6	804.32	790.81	2.09	0.02
12	842.89	61.72	881.47	808.17	12.52	1.51
13	950.91	61.12	977.91	893.04	14.6	2.67
14	999.13	70.98	1002.98	981.77	3.07	0.04
15	1041.56	64.01	1047.35	1008.77	6.74	0.27
16	1114.86	36.91	1170.79	1049.28	36.46	14.44
17	1186.22	65.33	1205.51	1172.72	5.65	0.15
18	1219.01	68.02	1222.87	1209.37	2.24	0.02
19	1249.87	62.15	1261.45	1222.87	7.24	0.42
20	1280.73	64.3	1284.59	1274.95	1.81	0.03
21	1300.02	64.59	1309.67	1294.24	2.86	0.11
22	1344.38	58.66	1365.6	1334.74	6.08	1.28
23	1448.54	68	1450.47	1440.83	1.49	0.03
24	1558.48	44.52	1566.2	1556.55	1.57	0.54
25	1585.49	77.89	1589.34	1579.7	1	0
26	1718.58	70.6	1720.5	1710.86	1.29	0.13



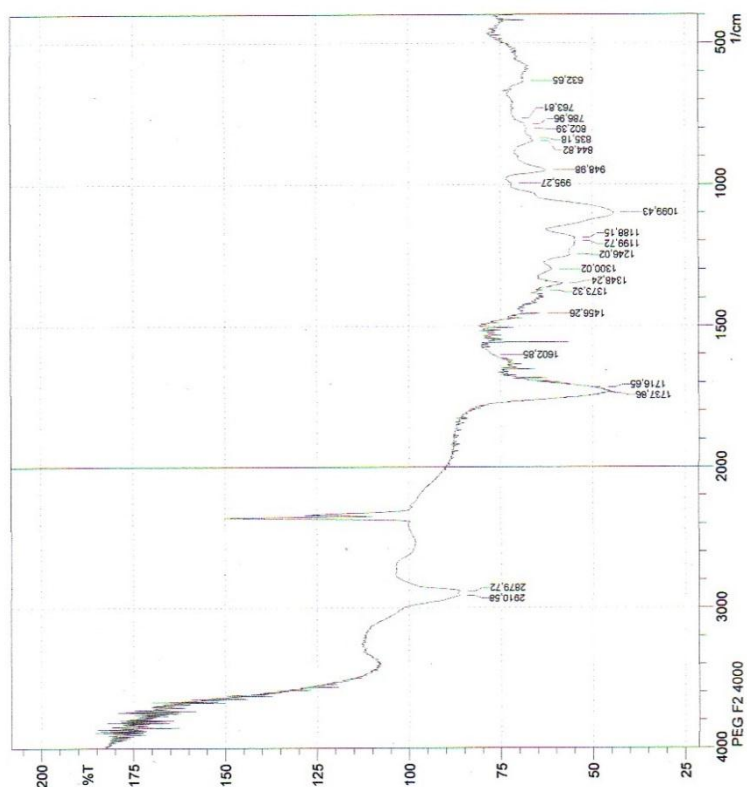
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PEG 4000 F1

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Resolution: 4 [1/cm]
Apodization: None

e. Spectra FTIR formula 2

SHIMADZU

Peak	Intensity	Corr. Int.	Base (H)	Base (L)	Area	Corr. Area
1	632.65	68.56	657.73	628.79	4.48	0.12
2	763.81	71.1	765.74	750.31	2.25	0.01
3	786.96	68.26	788.89	765.74	3.64	0.04
4	802.39	67.79	810.1	790.81	3.22	0.03
5	835.18	66.47	837.11	819.75	2.99	0.03
6	844.82	65.99	883.4	839.03	7.2	0.09
7	948.98	62.67	942	975.98	11.23	1.78
8	995.27	71.97	1001.06	981.77	2.68	0.04
9	1099.43	44.25	1157.29	1008.77	37.92	12.21
10	1188.15	54.74	1190.08	1159.22	7.14	0.09
11	1199.72	54.7	1201.65	1193.94	2.02	0.01
12	1246.02	56.13	1274.95	1242.16	7.53	0.16
13	1300.02	61.18	1309.67	1276.88	6.79	0.25
14	1348.24	58.27	1365.6	1342.46	5.08	0.55
15	1373.32	63.59	1382.96	1371.39	2.17	0.07
16	1456.26	64.29	1460.11	1444.68	2.51	0.16
17	1602.85	76.86	1604.77	1579.7	2.88	0.01
18	1716.65	47.78	1718.58	1703.14	4.16	0.13
19	1737.86	47.66	1776.44	1735.93	9.34	0.52
20	2879.72	86.16	2889.37	2798.71	1.96	0.24
21	2910.58	86.3	2999.31	2899.01	3.51	0.67



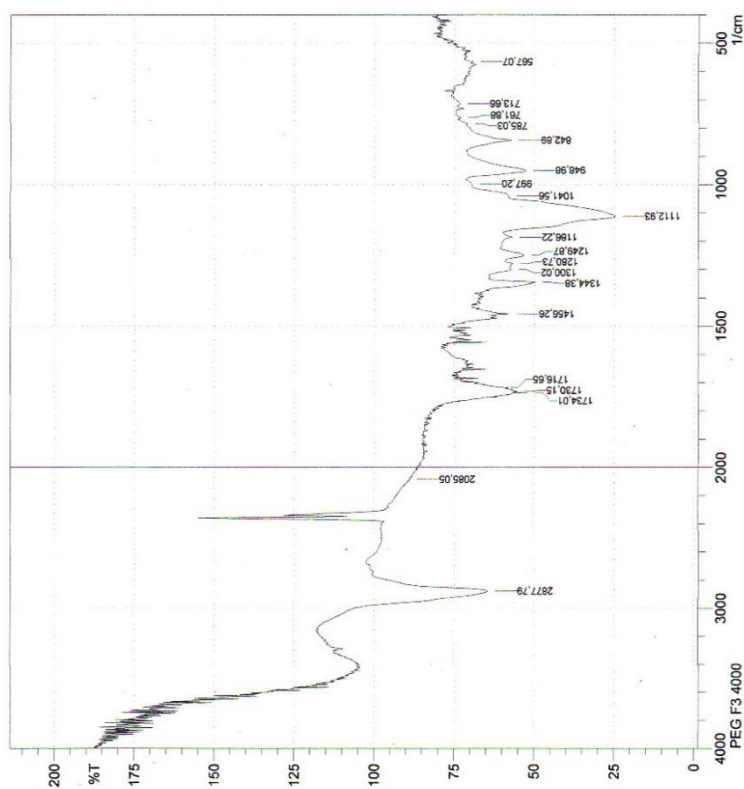
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 Apodization: None

Comment:
 PEG F2 4000

f. Spectra FTIR formula 3

SHIMADZU

Peak	Intensity	Corr. Int	Base (H)	Base (L)	Area	Corr. Area
1	567.07	69.11	1.36	570.93	555.5	2.32
2	713.66	73.09	0.96	719.45	702.09	2.31
3	761.88	72.91	1.06	765.74	750.31	2.04
4	785.03	70.89	1.06	788.89	769.6	2.73
5	842.89	57.2	13.45	875.68	802.39	13.37
6	948.98	52.73	18.6	977.91	891.11	17.59
7	997.2	69.46	0.35	999.13	981.77	2.64
8	1041.56	57.84	1.88	1047.35	1006.84	8.23
9	1112.93	24.73	34.02	1168.86	1049.28	49.97
10	1186.22	56.86	2.99	1207.44	1170.79	8.44
11	1249.87	53.11	6.66	1269.16	1222.87	11.36
12	1280.73	56.76	1.16	1284.59	1271.09	3.19
13	1300.02	57.26	2.03	1321.24	1294.24	6
14	1344.38	49.7	14.56	1369.46	1332.81	9.05
15	1456.26	57.84	6.83	1462.04	1440.83	4.24
16	1716.65	57.81	1.3	1718.58	1703.14	3
17	1730.15	55.32	1.33	1732.08	1722.43	2.39
18	1734.01	56.44	0.97	1776.44	1732.08	8.29
19	2085.05	86.84	0.23	2133.27	2083.12	2.37
20	2877.79	64.49	39.22	3007.02	2762.06	17.39



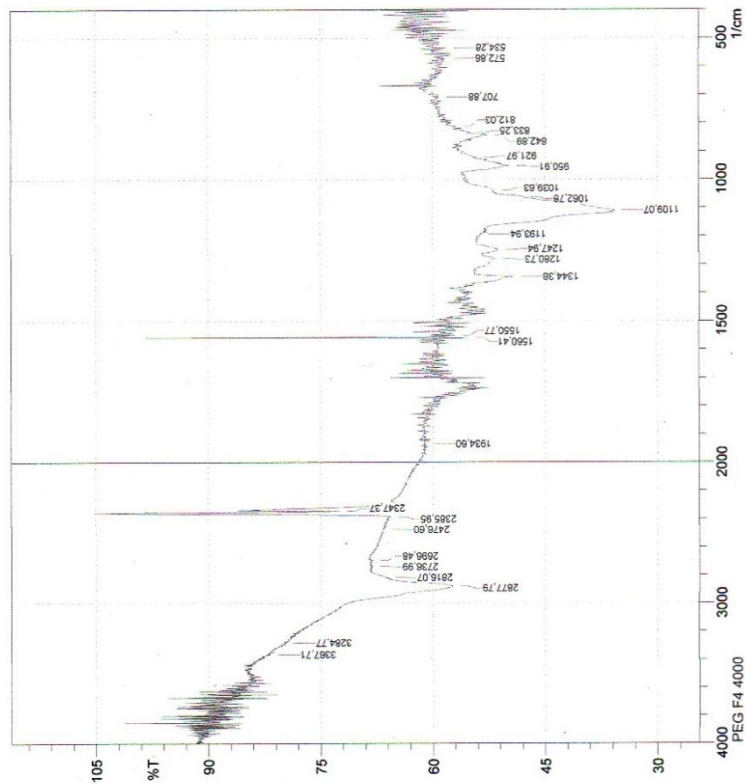
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 Apodization: None

Comment:
 PEG F3 4000

g. Spektra FTIR formula 4

SHIMADZU

Peak	Intensity	Corr. Inte	Base (H)	Base (L)	Area	Corr. Are
1	534.28	58.1	536.21	528.5	1.725	0.056
2	572.86	58.16	578.64	567.07	2.662	0.086
3	707.88	59.087	715.59	705.95	2.182	0.03
4	812.03	56.85	813.96	806.25	1.847	0.019
5	833.25	54.936	835.18	823.6	2.93	0.033
6	842.89	52.69	854.47	837.11	4.885	0.183
7	921.97	54.031	923.9	914.26	2.529	0.015
8	950.91	49.679	974.05	933.55	11.512	0.768
9	1039.63	51.683	1043.49	1012.63	8.448	0.092
10	1062.78	47.708	1064.71	1045.42	5.779	0.033
11	1109.07	35.709	1172.72	1064.71	39.6	7.389
12	1193.94	53.461	1203.58	1192.01	3.128	0.017
13	1247.94	51.155	1267.23	1224.8	11.861	0.46
14	1260.73	51.597	1292.31	1271.09	5.972	0.132
15	1344.38	49.205	1365.6	1334.74	8.866	0.685
16	1500.77	56.983	1552.7	1539.2	3.113	0.275
17	1560.41	55.231	1588.13	1568.48	1.825	0.983
18	1934.6	60.899	1936.53	1926.89	2.063	0.01
19	2347.37	72.42	2358.94	2341.58	1.363	0.902
20	2365.95	65.568	2387.87	2362.8	3.117	1.13
21	2476.6	66.646	2486.24	2472.74	2.377	0.006
22	2696.48	65.047	2698.41	2686.84	1.918	0.014
23	2736.99	68.039	2742.78	2735.06	1.285	0.009
24	2816.07	66.113	2818	2791	4.703	0.03
25	2877.79	57.367	2887.44	2818	14.554	0.399
26	3284.77	79.596	3296.35	3282.84	1.322	0.022
27	3367.71	81.675	3377.36	3365.78	0.988	0.013



Date/Time: 08/05/2019 13:56:12
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Comment:
 PEG F4 4000