

Lampiran 1. Dokumentasi



(Pelepah Kelapa)



(Serbuk Kayu Laban)



(Proses Karbonisasi)



(Proses Aktivasi)



(Karbon Aktif Serbuk Kayu Laban)



(Karbon Aktif Pelepah Kelapa)



(Proses Penetralan)



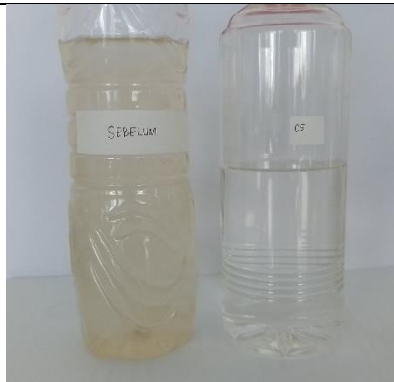
(Pengukuran Kadar Abu)



(Proses Adsorpsi)



(Pengukuran pH)



(Perbandingan Air Sungai)

Lampiran 2. Perhitungan Karbon Aktif

Perhitungan Molaritas Larutan H₃PO₄

1. H₃PO₄ 85%

$$M = \frac{\% \times \text{massa jenis} \times 10}{Mr}$$

$$M = \frac{85 \% \times 1,88 \text{ g/cm}^3 \times 10}{98 \text{ g/mol}}$$

$$M = 16,3$$

Perhitungan Rendemen Karbon

1. Karbon Pelepah Kelapa

$$\begin{aligned} \text{Rendemen} &= (\text{massa akhir} : \text{massa awal}) \times 100\% \\ &= (0,8686 \text{ gram} : 3 \text{ gram}) \times 100\% \\ &= 28,95\% \end{aligned}$$

2. Karbon Serbuk Kayu Laban

$$\begin{aligned} \text{Rendemen} &= (\text{massa akhir} : \text{massa awal}) \times 100\% \\ &= (0,6764 \text{ gram} : 3 \text{ gram}) \times 100\% \\ &= 21,55\% \end{aligned}$$

Perhitungan Kadar Air Karbon Aktif

1. AC-SK 1(100) = $\frac{39,9470 - 39,8485}{39,9470} \times 100 = 0,2465\%$
2. AC-SK 1(50) = $\frac{45,6710 - 45,6170}{45,6710} \times 100 = 0,1157\%$
3. AC-PK 1(100) = $\frac{42,2964 - 42,2505}{42,2964} \times 100 = 0,1085\%$
4. AC-PK 1(50) = $\frac{41,0788 - 41,0334}{41,0788} \times 100 = 0,1105\%$
5. AC-SK 2(100) = $\frac{41,0826 - 41,0605}{41,0826} \times 100 = 0,0537\%$
6. AC-SK 2(50) = $\frac{40,8568 - 40,8111}{40,8568} \times 100 = 0,1118\%$
7. AC-PK 2(100) = $\frac{44,6883 - 44,6515}{44,6883} \times 100 = 0,0823\%$
8. AC-PK 2(50) = $\frac{43,3223 - 43,2721}{43,3223} \times 100 = 0,1158\%$

Perhitungan Kadar Abu Karbon Aktif

1. AC-SK 1(100) = $\frac{40,1291 - 40,0516}{40,1291} \times 100 = 3,875\%$
2. AC-SK 1(50) = $\frac{40,0983 - 40,0671}{40,0983} \times 100 = 3,12\%$
3. AC-PK 1(100) = $\frac{39,8993 - 39,8383}{39,8993} \times 100 = 3,05\%$
4. AC-PK 1(50) = $\frac{43,7340 - 43,6704}{43,7340} \times 100 = 3,18\%$
5. AC-SK 2(100) = $\frac{44,6873 - 44,6358}{44,6873} \times 100 = 2,55\%$
6. AC-SK 2(50) = $\frac{41,3195 - 41,2537}{41,3195} \times 100 = 3,25\%$
7. AC-PK 2(100) = $\frac{42,3760 - 42,3077}{42,3760} \times 100 = 3,415\%$
8. AC-PK 2(50) = $\frac{38,9866 - 38,9181}{38,9866} \times 100 = 3,425\%$

Perhitungan Daya Serap Iodin Karbon Aktif

1. AC-SK 1(100) = $\frac{\left(10 - \frac{8,9 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 139,59 \text{ mg/g}$
2. AC-SK 1(50) = $\frac{\left(10 - \frac{6 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 507,6 \text{ mg/g}$
3. AC-PK 1(100) = $\frac{\left(10 - \frac{5,5 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 571,05 \text{ mg/g}$
4. AC-PK 1(50) = $\frac{\left(10 - \frac{6 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 507,6 \text{ mg/g}$
5. AC-SK 2(100) = $\frac{\left(10 - \frac{7 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 380,7 \text{ mg/g}$
6. AC-SK 2(50) = $\frac{\left(10 - \frac{8 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 253,8 \text{ mg/g}$
7. AC-PK 2(100) = $\frac{\left(10 - \frac{8,3 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 215,73 \text{ mg/g}$
8. AC-PK 2(50) = $\frac{\left(10 - \frac{8,5 \times 0,1}{0,1}\right) \times 12,69 \times 5}{0,5 \text{ gram}} = 190,35 \text{ mg/g}$

Luas Permukaan Karbon Aktif

AC-PK 1(50)



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Analysis
Operator: UPN Yogya Date: 2023/08/01 Report Operator: quantachrome Date: 2023/08/01
Sample ID: Mintan Filename: 20230801_1.qps
Sample Desc: Karbon aktif pelepah kelapa 50 mesh 1 M Comment: Quantachrome Nova 1200e
Sample weight: 0.126 g Sample Volume: 0.03231 cc
Outgas Time: 24.0 hrs Outgas Temp: 300.0 C
Analysis gas: Nitrogen Bath Temp: 273.0 K
Press. Tolerance: 0.100/0.100 (ads/des) Equil time: 60/60 sec (ads/des) Equil timeout: 120/120 sec (ads/des)
Analysis Time: 47.5 min End of run: 2023/08/01 12:58:11 Instrument: Nova Station A
Cell ID: 93

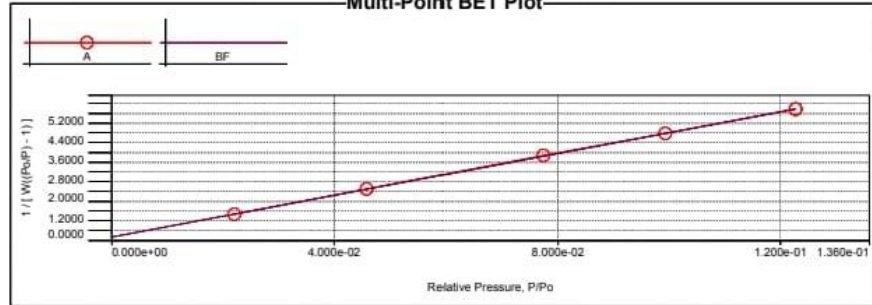
Data Reduction Parameters

Adsorbata	Nitrogen	Temperature	77.350K
	Molec. Wt.: 28.013	Cross Section:	16.200 Å ²
		Liquid Density:	0.808 g/cc

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
3.79500e-03	13.4450	9.92770e-02	20.1084	2.26954e-01	23.0478
6.34400e-03	14.6366	1.22752e-01	20.8185	2.51217e-01	23.4625
2.20500e-02	16.8131	1.50642e-01	21.4874	2.76453e-01	23.8494
4.58380e-02	18.1859	1.78521e-01	22.0785	2.98985e-01	24.2415
7.73840e-02	19.2987	2.02326e-01	22.5959		

Multi-Point BET Plot



Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
2.20500e-02	16.8131	1.0730e+00	9.92770e-02	20.1084	4.3856e+00
4.58380e-02	18.1859	2.1136e+00	1.22752e-01	20.8185	5.3778e+00
7.73840e-02	19.2987	3.4774e+00			

MBET summary

Slope =	42.716
Intercept =	1.475e-01
Correlation coefficient, r =	0.999953
C constant =	290.506
Surface Area =	81.247 m ² /g

AC-PK 1(100)



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Analysis	UPN Yogya	Date: 2023/08/02	Report	Operator: quantachrome	Date: 2023/08/03
Operator:	Mintan	Filename: 20230802_1.qps			
Sample ID:	Karbon Aktif Pelepah Kelapa 100 mesh 1 M	Comment: Quantachrome Nova 1200e			
Sample Desc:	0.1161 g	Sample Volume: 0.02977 cc			
Sample weight:	24.0 hrs	Outgas Temp: 300.0 C			
Outgas Time:	Nitrogen	Bath Temp: 273.0 K			
Analysis gas:	0.100/0.100 (ads/des)	Equil time: 60/60 sec (ads/des)	Equil timeout:	120/120 sec (ads/des)	
Press. Tolerance:	50.7 min	End of run: 2023/08/02 14:53:02	Instrument:	Nova Station A	
Analysis Time:	93				
Cell ID:					

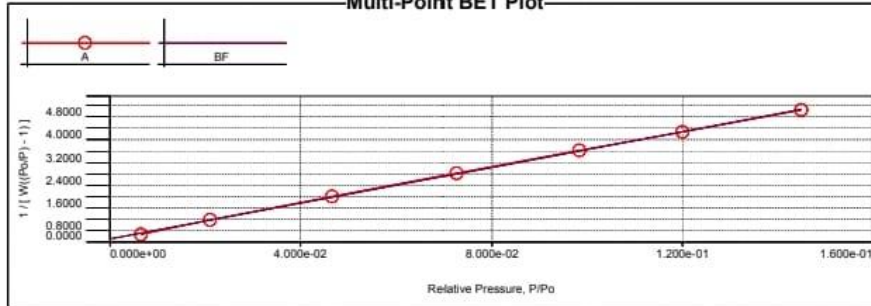
Data Reduction Parameters

Adsorbate	Nitrogen	Temperature	77.350K	Liquid Density:	0.808 g/cc
	Molec. Wt.: 28.013	Cross Section:	16.200 Å ²		

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.07400e-03	16.6727	9.83370e-02	27.1223	2.22720e-01	31.9625
6.50100e-03	19.3207	1.20008e-01	28.2383	2.45956e-01	32.7180
2.10160e-02	21.9981	1.44982e-01	29.2598	2.74349e-01	33.5035
4.66450e-02	24.4877	1.73978e-01	30.2555	2.98900e-01	34.2228
7.25460e-02	25.8897	1.99832e-01	31.1586		

Multi-Point BET Plot



Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
6.50100e-03	19.3207	2.7098e-01	9.83370e-02	27.1223	3.2173e+00
2.10160e-02	21.9981	7.8080e-01	1.20008e-01	28.2383	3.8641e+00
4.66450e-02	24.4877	1.5987e+00	1.44982e-01	29.2598	4.6368e+00
7.25460e-02	25.8897	2.4174e+00			

MBET summary

Slope =	31.377
Intercept =	1.118e-01
Correlation coefficient, r =	0.999851
C constant =	281.695
Surface Area =	110.595 m ² /g

AC-SK 1(50)



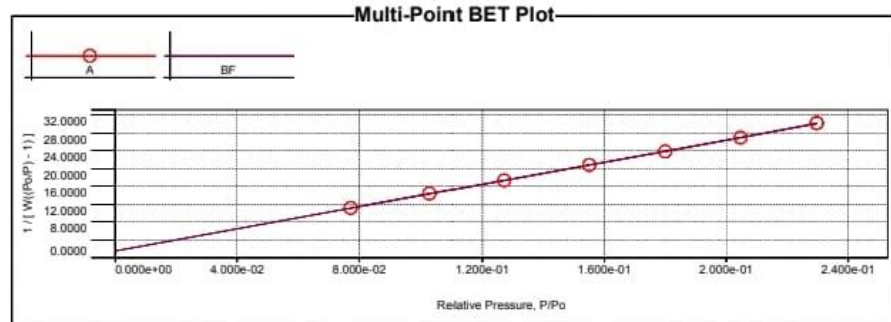
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Analysis	UPN Yogya	Date: 2023/08/04	Report	quantachrome	Date: 2023/08/07
Operator:	Minlan	Filename:	20230804_3.qps		
Sample ID:	Karbon Aktif Serbuk Kayu 50 mesh 1	MComment:	Quantachrome Nova 1200e		
Sample weight:	0.1234 g	Sample Volume:	0.03164 cc		
Outgas Time:	24.0 hrs	Outgas Temp:	300.0 C		
Analysis gas:	Nitrogen	Bath Temp:	273.0 K		
Press. Tolerance:	0.100/0.100 (ads/des)	Equil time:	60/60 sec (ads/des)	Equil timeout:	120/120 sec (ads/des)
Analysis Time:	45.5 min	End of run:	2023/08/04 16:13:03	Instrument:	Nova Station A
Cell ID:	93				

Data Reduction Parameters			
Adsorbate	Nitrogen	Temperature	77.350K
	Molec. Wt.: 28.013	Cross Section:	16.200 Å ²
		Liquid Density:	0.808 g/cc

Isotherm					
Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
8.71000e-03	4.2280	1.03145e-01	6.3902	2.29714e-01	7.9130
1.23040e-02	4.6061	1.27170e-01	6.7392	2.53282e-01	8.1532
2.57360e-02	5.0892	1.55055e-01	7.0619	2.76700e-01	8.4036
4.99050e-02	5.6151	1.79959e-01	7.3684	3.01476e-01	8.6293
7.73280e-02	6.0174	2.04770e-01	7.6515		



Multi-Point BET					
Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
7.73280e-02	6.0174	1.1144e+01	1.79959e-01	7.3684	2.3829e+01
1.03145e-01	6.3902	1.4400e+01	2.04770e-01	7.6515	2.6926e+01
1.27170e-01	6.7392	1.7298e+01	2.29714e-01	7.9130	3.0154e+01
1.55055e-01	7.0619	2.0792e+01			

MBET summary	
Slope =	124.247
Intercept =	1.530e+00
Correlation coefficient, r =	0.999970
C constant =	82.201
Surface Area =	27.688 m ² /g

AC-SK 1(100)



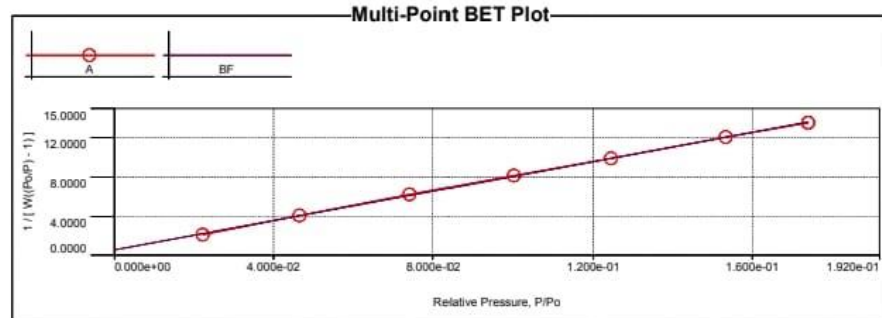
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Analysis	UPN Yogya	Date: 2023/08/02	Report	Operator: quantachrome	Date: 2023/08/03
Operator:	Minlan	Filename: 20230802_3.qps			
Sample ID:	Karbon Aktif Serbuk Kayu 100 mesh 1 MComment: Quantachrome Nova 1200e				
Sample weight:	0.1471 g	Sample Volume:	0.03772 cc		
Outgas Time:	24.0 hrs	Outgas Temp:	300.0 C		
Analysis gas:	Nitrogen	Bath Temp:	273.0 K		
Press. Tolerance:	0.100/0.100 (ads/des)	Equil time:	60/60 sec (ads/des)	Equil timeout:	120/120 sec (ads/des)
Analysis Time:	45.9 min	End of run:	2023/08/02 16:55:58	Instrument:	Nova Station A
Cell ID:	92				

Data Reduction Parameters			
Adsorbate	Nitrogen	Temperature	77.350K
	Molec. Wt.: 28.013	Cross Section:	16.200 Å ²
		Liquid Density:	0.808 g/cc

Isotherm					
Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
8.02600e-03	7.1734	1.00076e-01	10.9451	2.29025e-01	13.2301
9.64200e-03	7.8740	1.24456e-01	11.4954	2.55386e-01	13.5891
2.21800e-02	8.7272	1.53324e-01	12.0026	2.79639e-01	13.9276
4.65250e-02	9.6300	1.74080e-01	12.4492	3.01750e-01	14.2377
7.41890e-02	10.3279	2.01558e-01	12.8528		



Multi-Point BET					
Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
2.21800e-02	8.7272	2.0796e+00	1.24456e-01	11.4954	9.8938e+00
4.65250e-02	9.6300	4.0542e+00	1.53324e-01	12.0026	1.2072e+01
7.41890e-02	10.3279	6.2081e+00	1.74080e-01	12.4492	1.3546e+01
1.00076e-01	10.9451	8.1293e+00			

MBET summary	
Slope =	75.229
Intercept =	5.302e-01
Correlation coefficient, r =	0.999831
C constant =	142.876
Surface Area =	45.968 m ² /g

AC-PK 2(50)



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Analysis	UPN Yogya	Date:2023/08/04	Report	quantachrome	Date:2023/08/04
Operator:	Mintan	Filename:	20230804_1.qps		
Sample ID:	Karbon Aktif Pelepah Kelapa 50 mesh 2 M		Comment:	Quantachrome Nova 1200e	
Sample weight:	0.1123 g	Sample Volume:	0.02879 cc		
Outgas Time:	24.0 hrs	Outgas Temp:	300.0 C		
Analysis gas:	Nitrogen	Bath Temp:	273.0 K		
Press. Tolerance:	0.100/0.100 (ads/des)	Equil time:	60/60 sec (ads/des)	Equil timeout:	120/120 sec (ads/des)
Analysis Time:	46.9 min	End of run:	2023/08/04 13:59:22	Instrument:	Nova Station A
Cell ID:	91				

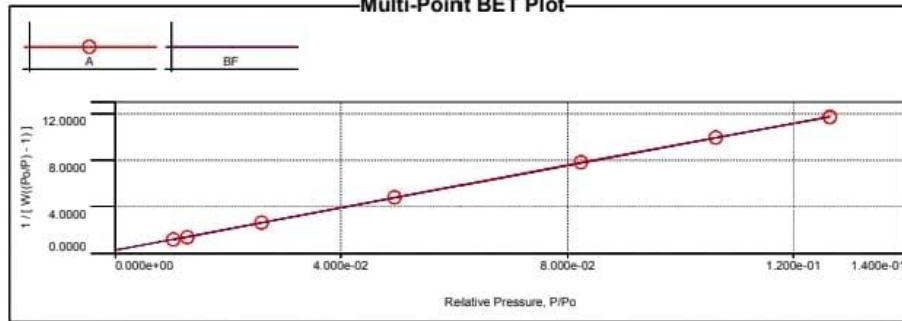
Data Reduction Parameters

Adsorbate	Nitrogen	Temperature	77.350K	Liquid Density:	0.808 g/cc
	Molec. Wt.: 28.013	Cross Section:	16.200 Å ²		

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
1.03240e-02	6.9757	1.06278e-01	9.5784	2.29417e-01	10.8077
1.27840e-02	7.4448	1.26517e-01	9.9049	2.55216e-01	10.9856
2.59600e-02	8.0615	1.57073e-01	10.1778	2.80028e-01	11.1409
4.95540e-02	8.6862	1.78023e-01	10.4155	3.04313e-01	11.2778
8.23680e-02	9.1966	2.02250e-01	10.6177		

Multi-Point BET Plot



Multi-Point BET

Relative Pressure [P/P0]	Volume @ STP [cc/g]	1 / [W((P0/P) - 1)]	Relative Pressure [P/P0]	Volume @ STP [cc/g]	1 / [W((P0/P) - 1)]
1.03240e-02	6.9757	1.1965e+00	8.23680e-02	9.1966	7.8093e+00
1.27840e-02	7.4448	1.3917e+00	1.06278e-01	9.5784	9.9334e+00
2.59600e-02	8.0615	2.6452e+00	1.26517e-01	9.9049	1.1700e+01
4.95540e-02	8.6862	4.8026e+00			

MBET summary

Slope =	90.768
Intercept =	2.744e-01
Correlation coefficient, r =	0.999953
C constant =	331.844
Surface Area =	38.252 m ² /g

AC-PK 2(100)



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Analysis	UPN Yogya	Date:2023/08/07	Report	Operator: quantachrome	Date:2023/08/07
Operator:	Mintan	Filename:	20230807_1.qps		
Sample ID:	Karbon Aktif Serbuk Kayu 100 mesh 2	MComment:	Quantachrome Nova 1200e		
Sample Desc:	0.1313 g	Sample Volume:	0.03367 cc		
Sample weight:	24.0 hrs	Outgas Temp:	300.0 C		
Outgas Time:	Nitrogen	Bath Temp:	273.0 K		
Analysis gas:	0.100/0.100 (ads/des)	Equil time:	60/60 sec (ads/des)	Equil timeout:	120/120 sec (ads/des)
Press. Tolerance:	35.9 min	End of run:	2023/08/07 10:14:39	Instrument:	Nova Station A
Analysis Time:	92				
Cell ID:					

Data Reduction Parameters

Adsorbate	Nitrogen	Temperature	77.350K	Liquid Density:	0.808 g/cc
	Molec. Wt.: 28.013	Cross Section:	16.200 Å²		

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
4.41100e-03	0.7288	1.08402e-01	1.2254	2.32415e-01	1.4101
1.29320e-02	0.8123	1.28759e-01	1.2779	2.57783e-01	1.4387
2.82720e-02	0.9302	1.55178e-01	1.3222	2.81645e-01	1.4649
5.36410e-02	1.0707	1.79392e-01	1.3552	3.05576e-01	1.5420
8.52390e-02	1.1425	2.05805e-01	1.3799		

Multi-Point BET Plot



Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((P/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((P/P) - 1)]
1.29320e-02	0.8123	1.2904e+01	1.08402e-01	1.2254	7.9383e+01
2.82720e-02	0.9302	2.5027e+01	1.28759e-01	1.2779	9.2531e+01
5.36410e-02	1.0707	4.2358e+01	1.55178e-01	1.3222	1.1115e+02
8.52390e-02	1.1425	6.5254e+01			

MBET summary

Slope =	683.858
Intercept =	5.308e+00
Correlation coefficient, r =	0.999658
C constant =	129.845
Surface Area =	5.053 m²/g

AC-SK 2(50)



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Analysis	UPN Yogya	Date:2023/08/02	Report	Operator: quantachrome	Date:2023/08/02
Operator:	Mintan	Filename:	20230802_2.qps		
Sample ID:	Karbon Aktif Serbuk Kayu 50 mesh 2M	Comment:	Quantachrome Nova 1200e		
Sample Desc:	0.1272 g	Sample Volume:	0.03262 cc		
Sample weight:	24.0 hrs	Outgas Temp:	300.0 C		
Outgas Time:	Nitrogen	Bath Temp:	273.0 K		
Analysis gas:	0.100/0.100 (ads/des)	Equil time:	60/60 sec (ads/des)	Equil timeout:	120/120 sec (ads/des)
Press. Tolerance:	39.7 min	End of run:	2023/08/02 15:54:15	Instrument:	Nova Station A
Analysis Time:	91				
Cell ID:					

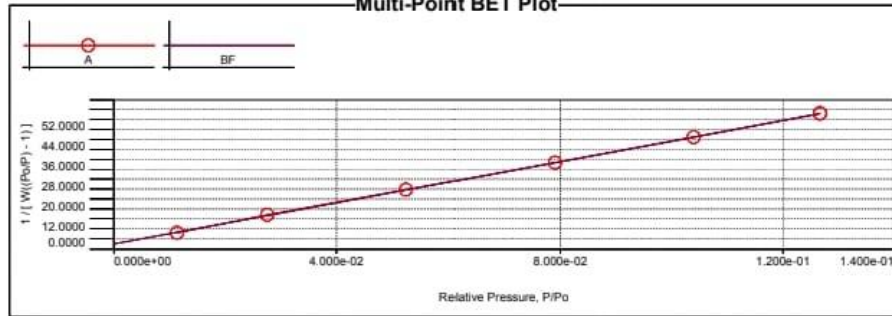
Data Reduction Parameters

Adsorbate	Nitrogen	Temperature	77.350K	Liquid Density:	0.808 g/cc
	Molec. Wt.: 28.013	Cross Section:	16.200 Å²		

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.22400e-03	1.1036	1.03990e-01	2.0799	2.28464e-01	2.3010
1.13810e-02	1.4153	1.26687e-01	2.1446	2.55824e-01	2.3498
2.75740e-02	1.6525	1.54719e-01	2.2097	2.78203e-01	2.4009
5.25190e-02	1.8686	1.82600e-01	2.2520	3.03542e-01	2.4279
7.90450e-02	1.9918	2.06827e-01	2.2824		

Multi-Point BET Plot



Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
1.13810e-02	1.4153	6.5082e+00	7.90450e-02	1.9918	3.4477e+01
2.75740e-02	1.6525	1.3729e+01	1.03990e-01	2.0799	4.4647e+01
5.25190e-02	1.8686	2.3735e+01	1.26687e-01	2.1446	5.4120e+01

MBET summary

Slope =	410.115
Intercept =	2.113e+00
Correlation coefficient, r =	0.999942
C constant =	195.063
Surface Area =	8.448 m²/g

AC-SK 2(100)



UPT LABORATORIUM TERPADU
 UNIVERSITAS PEMBANGUNAN NASIONAL "VETERAN" YOGYAKARTA
 Jalan Babarsari 2 Tambakbayan Yogyakarta 55281; Laman: www.labterpadu.upnyk.ac.id
 Quantachrome NovaWin ©1994-2013, Quantachrome Instruments v11.03



Analysis
 Operator: quantachrome Date:2023/08/03
 Sample ID: Mintan Filename: 20230803_1.qps
 Sample Desc: Karbon Aktif Serbuk Kayu 100 mesh 2 MComment:Quantachrome Nova 1200e
 Sample weight: 0.1008 g Sample Volume: 0.02585 cc
 Outgas Time: 24.0 hrs Outgas Temp: 300.0 C
 Analysis gas: Nitrogen Bath Temp: 273.0 K
 Press. Tolerance: 0.100/0.100 (ads/des) Equil time: 60/60 sec (ads/des) Equil timeout: 120/120 sec (ads/des)
 Analysis Time: 45.0 min End of run: 2023/08/03 14:42:23 Instrument: Nova Station A
 Cell ID: 92

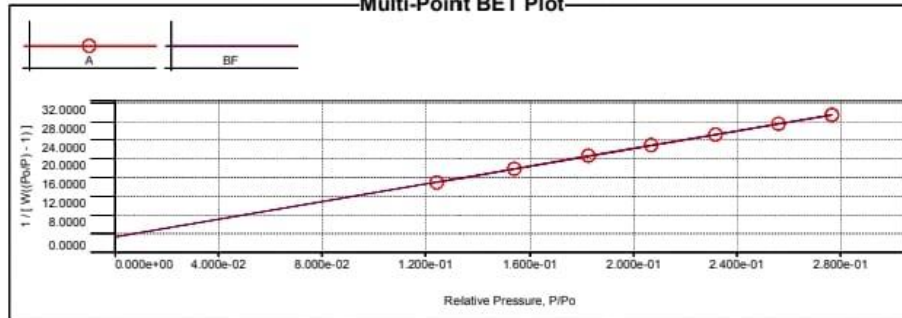
Data Reduction Parameters

Adsorbate	Nitrogen	Temperature	77.350K	Liquid Density:	0.808 g/cc
	Molec. Wt.: 28.013	Cross Section:	16.200 Å ²		

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.15200e-03	3.6016	1.03458e-01	7.0920	2.31691e-01	9.5824
9.64500e-03	4.3194	1.24467e-01	7.6244	2.56044e-01	10.0236
2.45260e-02	5.0634	1.53876e-01	8.1563	2.76740e-01	10.4205
4.95620e-02	5.8594	1.82563e-01	8.6461	3.00775e-01	10.8121
7.46670e-02	6.4792	2.06794e-01	9.0959		

Multi-Point BET Plot



Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
1.24467e-01	7.6244	1.4919e+01	2.31691e-01	9.5824	2.5180e+01
1.53876e-01	8.1563	1.7840e+01	2.56044e-01	10.0236	2.7472e+01
1.82563e-01	8.6461	2.0668e+01	2.76740e-01	10.4205	2.9379e+01
2.06794e-01	9.0959	2.2933e+01			

MBET summary

Slope =	94.630
Intercept =	3.266e+00
Correlation coefficient, r =	0.999853
C constant =	29.972
Surface Area =	35.574 m ² /g

Lampiran 3. Adsorpsi Kontaminan

Perhitungan TSS

$$\text{mg TSS per liter} = \frac{(A-B) \times 1000}{\text{Volume contoh uji, mL}}$$

$$\text{Inlet Awal} = \frac{(0,5848 - 0,5378) \times 1000}{100 \text{ mL}} = 546 \text{ mg/L}$$

$$A3 = \frac{(0,5816 - 0,5327) \times 1000}{100 \text{ mL}} = 489 \text{ mg/L}$$

$$A6 = \frac{(0,6007 - 0,5534) \times 1000}{100 \text{ mL}} = 473 \text{ mg/L}$$

$$A9 = \frac{(0,5950 - 0,5500) \times 1000}{100 \text{ mL}} = 450 \text{ mg/L}$$

$$A12 = \frac{(0,5740 - 0,5489) \times 1000}{100 \text{ mL}} = 251 \text{ mg/L}$$

$$A15 = \frac{(0,5920 - 0,5742) \times 1000}{100 \text{ mL}} = 180 \text{ mg/L}$$

$$B3 = \frac{(0,5999 - 0,5536) \times 1000}{100 \text{ mL}} = 463 \text{ mg/L}$$

$$B6 = \frac{(0,5989 - 0,5542) \times 1000}{100 \text{ mL}} = 447 \text{ mg/L}$$

$$B9 = \frac{(0,5809 - 0,5364) \times 1000}{100 \text{ mL}} = 445 \text{ mg/L}$$

$$B12 = \frac{(0,5765 - 0,5497) \times 1000}{100 \text{ mL}} = 268 \text{ mg/L}$$

$$B15 = \frac{(0,5888 - 0,5658) \times 1000}{100 \text{ mL}} = 230 \text{ mg/L}$$

$$C3 = \frac{(0,5772 - 0,5313) \times 1000}{100 \text{ mL}} = 459 \text{ mg/L}$$

$$C6 = \frac{(0,5947 - 0,5491) \times 1000}{100 \text{ mL}} = 456 \text{ mg/L}$$

$$C9 = \frac{(0,5777 - 0,5399) \times 1000}{100 \text{ mL}} = 378 \text{ mg/L}$$

$$C12 = \frac{(0,5614 - 0,537) \times 1000}{100 \text{ mL}} = 237 \text{ mg/L}$$

$$C15 = \frac{(0,5918 - 0,5706) \times 1000}{100 \text{ mL}} = 212 \text{ mg/L}$$

Lampiran 4. Hasil Analisis Parameter COD dan BOD

Parameter COD Awal



PEMERINTAH KABUPATEN PURBALINGGA
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UPTD LABORATORIUM KESEHATAN KABUPATEN
Jl. Letkol Isdiman No.15 Purbalingga Telp. 0281-891134



HASIL PEMERIKSAAN LABORATORIUM

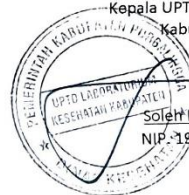
Kode Lab : 022 / BA / KK / LAB / V / 23
 Pemohon : Mintan Mawarni
 Alamat : Mahasiswa Politeknik Negeri Cilacap
 Jenis Pemeriksaan : Air Badan Air
 Tanggal Pengambilan : 09 Mei 2023
 Lokasi Pengambilan : Badan Air Sungai Muara Donan
 Diambil Oleh : Mintan Mawarni (Mahasiswa Politeknik Negeri Cilacap)
 Diperiksa Oleh : Fibrina Sustiana

Mengacu pada PP No. 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup

No	Parameter	Satuan	Kriteria Mutu Air Berdasarkan Kelas				Hasil Pemeriksaan
			I	II	III	IV	
1	COD	mg/L	10	25	40	80	24

Purbalingga, 15 Mei 2023

Kepala UPTD Laboratorium Kesehatan
Kabupaten Purbalingga



Solo H Marsam, SKM., M.Kes
NIP. 19720727 199603 1 005

Parameter BOD awal



HASIL PEMERIKSAAN LABORATORIUM

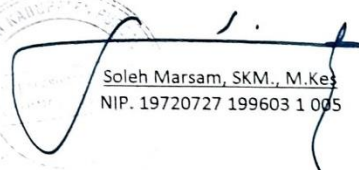
Kode Lab : 021 / BA / KK / LAB / V / 23
Pemohon : Mintan Mawarni
Alamat : Mahasiswa Politeknik Negeri Cilacap
Jenis Pemeriksaan : Air Badan Air
Tanggal Pengambilan : 09 Mei 2023
Lokasi Pengambilan : Badan Air Sungai Muara Donan
Diambil Oleh : Mintan Mawarni (Mahasiswa Politeknik Negeri Cilacap)
Diperiksa Oleh : Fibria Sustiana

Mengacu pada PP No. 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup

No	Parameter	Satuan	Kriteria Mutu Air Berdasarkan Kelas				Hasil Pemeriksaan
			I	II	III	IV	
1	BOD5	mg/L	2	3	6	12	3,04

Purbalingga, 15 Mei 2023

Kepala UPTD Laboratorium Kesehatan
Kabupaten Purbalingga


Soleh Marsam, SKM., M. Kes
NIP. 19720727 199603 1 005

Parameter COD dan BOD Setelah Proses Adsorpsi



PEMERINTAH KABUPATEN PURBALINGGA
DINAS KESEHATAN
UPTD LABORATORIUM KESEHATAN KABUPATEN
Jl. Letkol Isdiman No.15 Purbalingga Telp. 0281-891134



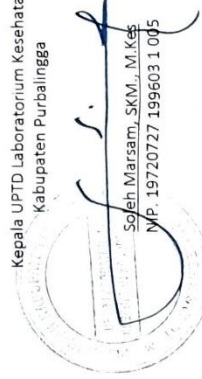
HASIL PEMERIKSAAN LABORATORIUM

Pemohon : Mintan Mawarni
Alamat Pemohon : Mahasiswa Politeknik Negeri Cilacap
Jenis Pemeriksaan : Air Badan Air
Parameter Diperiksa : BOD dan COD pada Air Badan Air
Tanggal Pengiriman : 12 Juli 2023
Diambil Oleh : Mintan Mawarni (Mahasiswa Politeknik Negeri Cilacap)

Mengacu pada :
PP No. 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup

No	Kode Laboratorium	Kode Sampel	BOD (mg/L)				COD (mg/L)						
			Kelas 1	Kelas 2	Kelas 3	Kelas 4	Hasil Pemeriksaan	Kelas 1	Kelas 2	Kelas 3	Kelas 4	Hasil Pemeriksaan	
1	054 / BA / KK / LAB / VII / 23	Sampel A1					30,96						197
2	055 / BA / KK / LAB / VII / 23	Sampel A2					20,46						133
3	056 / BA / KK / LAB / VII / 23	Sampel A3					12,96						86
4	057 / BA / KK / LAB / VII / 23	Sampel A4					16,96						113
5	058 / BA / KK / LAB / VII / 23	Sampel A5					12,04						82
6	059 / BA / KK / LAB / VII / 23	Sampel B1					22,04						132
7	060 / BA / KK / LAB / VII / 23	Sampel B2					22,46						126
8	061 / BA / KK / LAB / VII / 23	Sampel B3	2	3	6	12	20,46			10	25	40	117
9	062 / BA / KK / LAB / VII / 23	Sampel B4					10,46						94
10	063 / BA / KK / LAB / VII / 23	Sampel B5					5,46						39
11	064 / BA / KK / LAB / VII / 23	Sampel C1					10,96						76
12	065 / BA / KK / LAB / VII / 23	Sampel C2					9,03						68
13	066 / BA / KK / LAB / VII / 23	Sampel C3					8,46						52
14	067 / BA / KK / LAB / VII / 23	Sampel C4					6,46						46
15	068 / BA / KK / LAB / VII / 23	Sampel C5					4,46						38

Purbalingga, 20 Juli 2023
Kepala UPTD Laboratorium Kesehatan
Kabupaten Purbalingga



Diverifikasi Oleh :

Diperiksa Oleh :

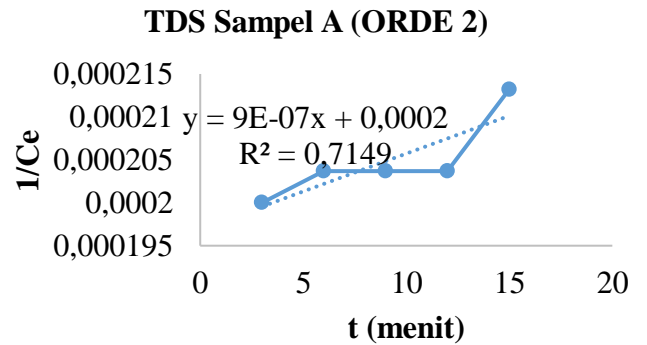
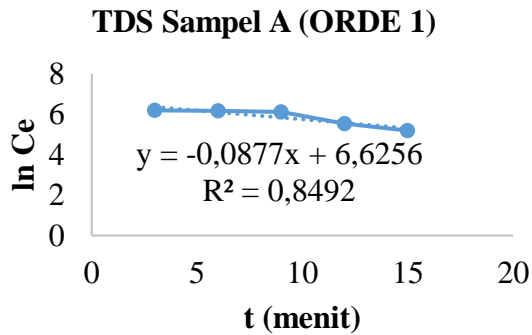
(Dyah Nuraini L, S.ST)

(Fibria Sustiana)

Lampiran 5. Kinetika Adsorpsi

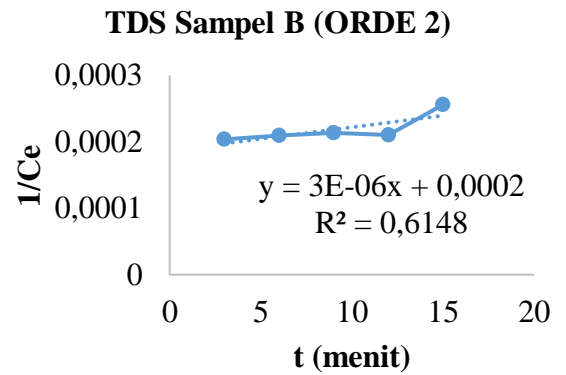
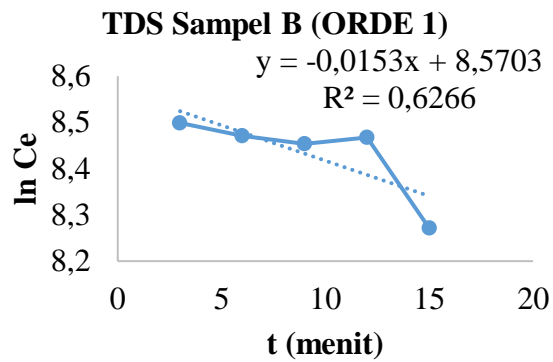
TDS Sampel A

Co	5170 mg/L				
Ce	5000 mg/L	4910 mg/L	4910 mg/L	4910 mg/L	4960 mg/L
t (menit)	3	6	9	12	15
ln Ce	8,51719	8,49903	8,49903	8,49903	8,45319
1/Ce	0,0002	0,0002	0,0002	0,0002	0,00021



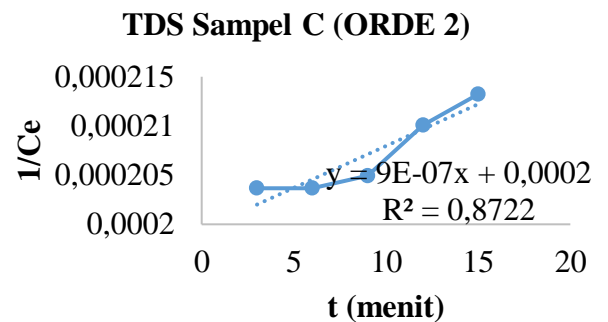
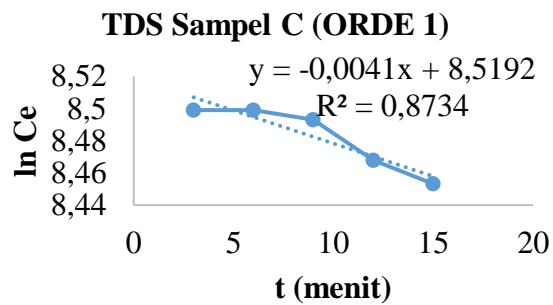
TDS Sampel B

Co	5170 mg/L				
Ce	4910	4777	4690	4760	3910
t (menit)	3	6	9	12	15
ln Ce	8,49903	8,47157	8,45319	8,468	8,27129
1/Ce	0,0002	0,00021	0,00021	0,00021	0,00026



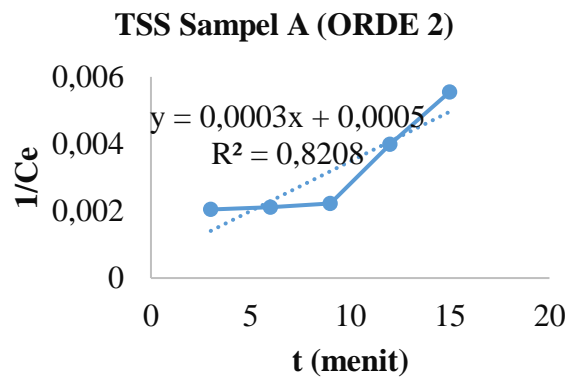
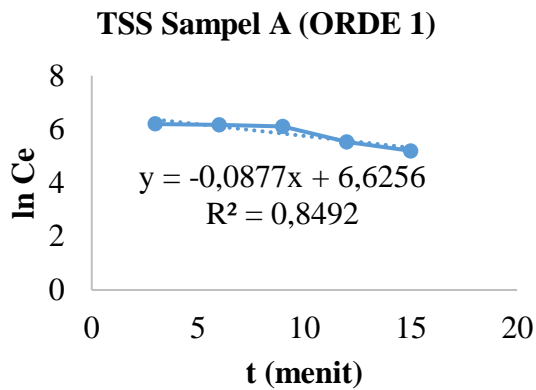
TDS Sampel C

Co	5170 mg/L				
Ce	4910	4910	4880	4760	4690
t (menit)	3	6	9	12	15
ln Ce	8,49903	8,49903	8,4929	8,468	8,45319
1/Ce	0,0002	0,0002	0,0002	0,00021	0,00021



TSS Sampel A

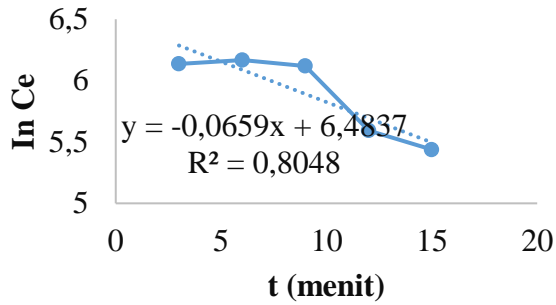
Co	546				
Ce	489	473	450	251	180
t (menit)	3	6	9	12	15
In Ce	6,19236	6,1591	6,10925	5,52545	5,19296
1/Ce	0,00204	0,00211	0,00222	0,00398	0,00556



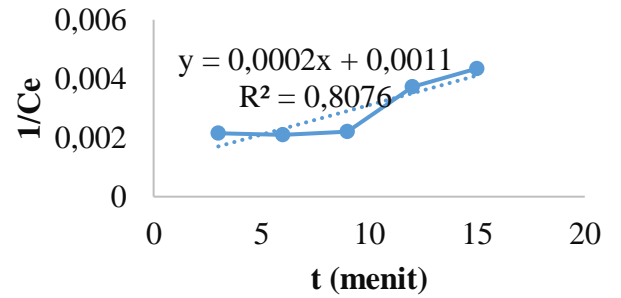
TSS Sampel B

Co	546				
Ce	463	477	455	268	230
t (menit)	3	6	9	12	15
In Ce	6,13773	6,16752	6,1203	5,59099	5,43808
1/Ce	0,00216	0,0021	0,0022	0,00373	0,00435

TSS SAMPEL B (ORDE 1)



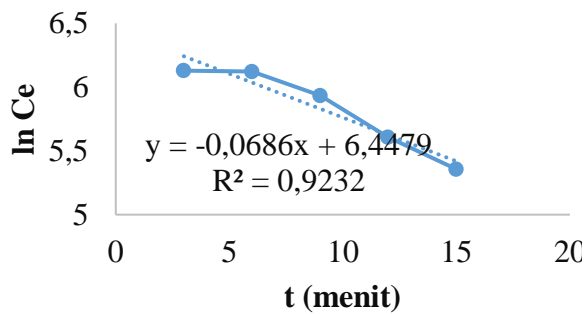
TSS SAMPEL B (ORDE 2)



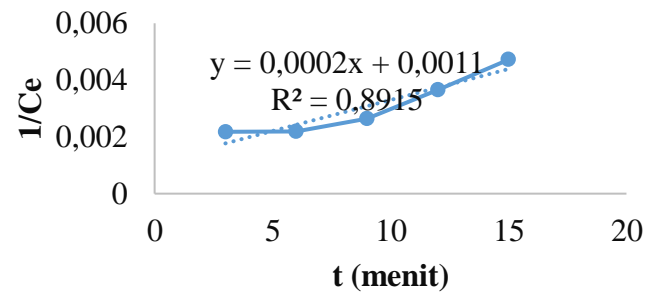
TSS Sampel C

Co	546				
Ce	459	456	378	273	212
t (menit)	3	6	9	12	15
ln Ce	6,12905	6,12249	5,93489	5,60947	5,35659
1/Ce	0,00218	0,00219	0,00265	0,00366	0,00472

TSS Sampel C (ORDE 1)



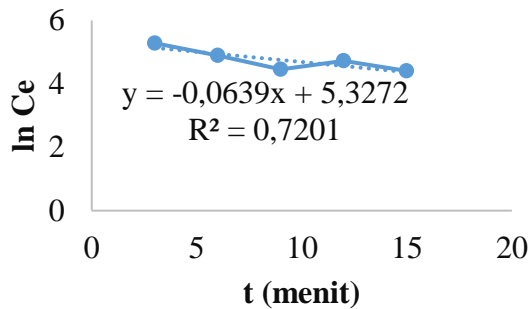
TSS SAMPEL C (ORDE 2)



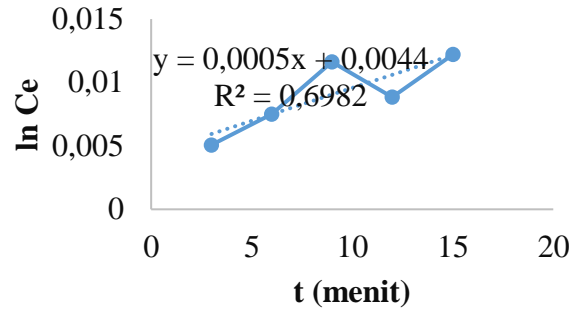
COD Sampel A

Co	24				
Ce	197	133	86	113	82
t (menit)	3	6	9	12	15
In Ce	5,2832	4,89035	4,45435	4,72739	4,40672
1/Ce	0,00508	0,00752	0,01163	0,00885	0,0122

COD Sampel A (ORDE 1)



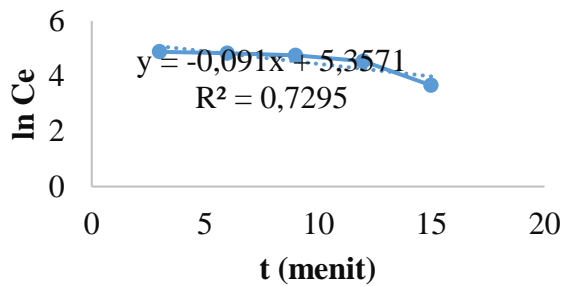
COD Sampel A (ORDE 2)



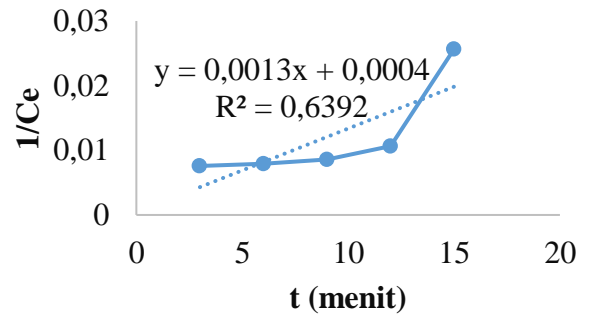
COD Sampel B

Co	24				
Ce	132	126	117	94	39
t (menit)	3	6	9	12	15
In Ce	4,8828	4,83628	4,76217	4,54329	3,66356
1/Ce	0,00758	0,00794	0,00855	0,01064	0,02564

COD Sampel B (ORDE 1)

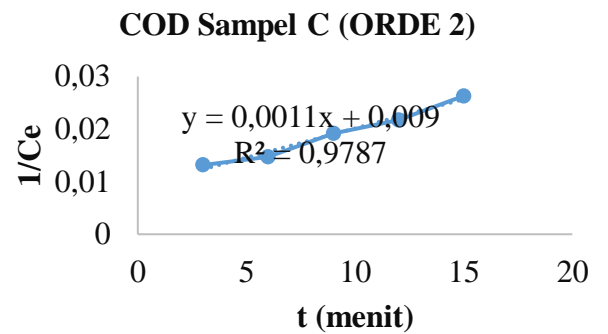
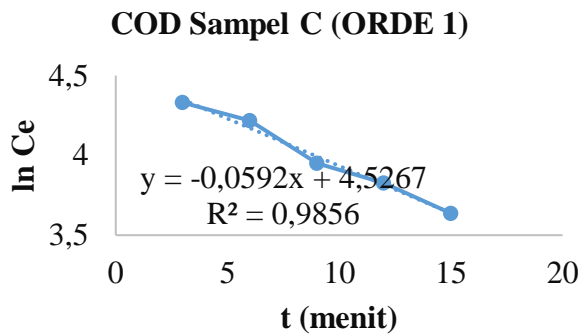


COD Sampel B (ORDE 2)



COD Sampel C

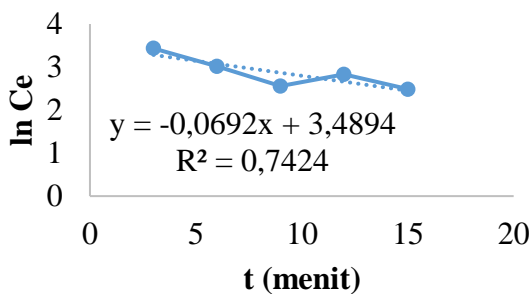
Co	24				
Ce	76	68	52	46	38
t (menit)	3	6	9	12	15
In Ce	4,33073	4,21951	3,95124	3,82864	3,63759
1/Ce	0,01316	0,01471	0,01923	0,02174	0,02632



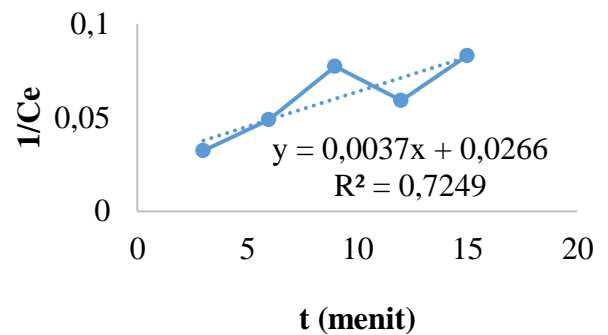
BOD Sampel A

Co	3,04				
Ce	30,96	20,46	12,96	16,96	12,04
t (menit)	3	6	9	12	15
In Ce	3,4327	3,01847	2,56187	2,83086	2,48823
1/Ce	0,0323	0,04888	0,07716	0,05896	0,08306

BOD Sampel A (ORDE 1)



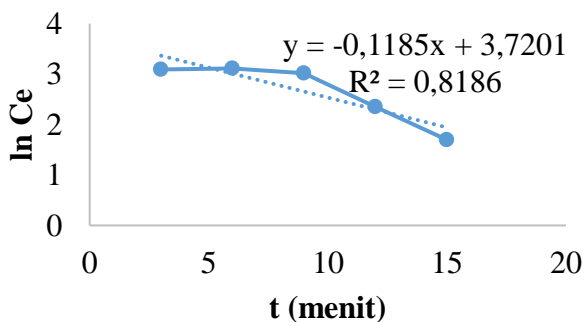
BOD Sampel A (ORDE 2)



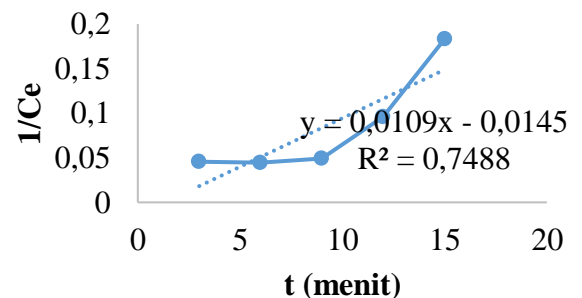
BOD Sampel B

Co	3,04				
Ce	22,04	22,46	20,46	10,46	5,46
t (menit)	3	6	9	12	15
In Ce	3,09286	3,11174	3,01847	2,34756	1,69745
1/Ce	0,04537	0,04452	0,04888	0,0956	0,18315

BOD Sampel B (ORDE 1)

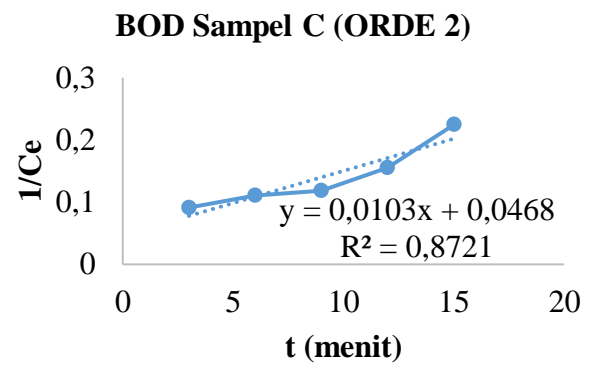
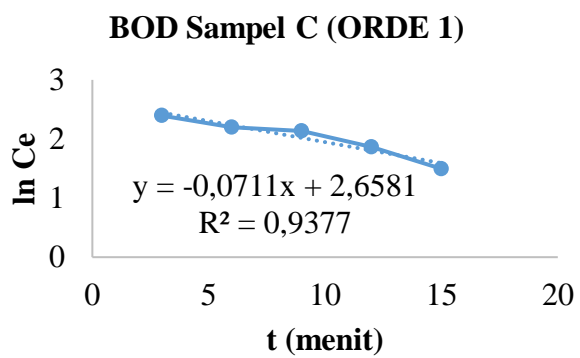


BOD Sampel B (ORDE 2)



BOD Sampel C

Co	3,04				
Ce	10,96	9,03	8,46	6,46	4,46
t (menit)	3	6	9	12	15
In Ce	2,39425	2,20055	2,13535	1,86563	1,49515
1/Ce	0,09124	0,11074	0,1182	0,1548	0,22422



Lampiran 6. Bukti Submit Jurnal

The screenshot shows a web browser window displaying the OJS Submissions page. The browser's address bar shows the URL `talenta.usu.ac.id/jtk/submissions`. The page header includes the journal title "Jurnal Teknik Kimia USU" and the user's name "mintan_11". The main content area is titled "Submissions" and has tabs for "My Queue" (with a count of 1) and "Archives". A "Help" button is visible in the top right corner of the submission area.

Under the "My Assigned" section, there is a search bar and a "New Submission" button. A single submission is listed with the ID "13396" and the author "Mintan Mawarni et al.". The title of the submission is "Bioadsorben dari Pelepah Kelapa dan Serbuk Kayu Sebagai Penjernihan Air Sungai Muara Donan Kabupaten Cilacap". A red "Submission" button is next to the entry. Below the submission details, there is a section for "Open discussions" showing "0" discussions and a note that "Last activity recorded on Friday, August 18, 2023." A "View Submission" button is located at the bottom right of the submission card.

The Windows taskbar at the bottom of the screen shows the search bar, several application icons, and system information including the temperature (26°C), weather (Cerah), and date (18/08/2023).

Lampiran 7. Draft Jurnal



Bioadsorben Dari Pelepeh Kelapa dan Serbuk Kayu Sebagai Penjernihan Air Sungai Muara Donan Kabupaten Cilacap

Bioadsorbent From Coconut Fronds and Wood Powder Ad Water Purification Of Donan Estuary River In Cilacap Regency

Mintan Mawarni¹, Nurlinda Ayu Triwuri^{*2}, Ilma Fadlilah¹

^{1,2}Teknik Pengendalian Pencemaran Lingkungan, Politeknik Negeri Cilacap, Jalan Dr. Soetomo, Cilacap, 53212, Indonesia

*Email: nurlindayu.triwuri@tmc.ac.id

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Mulai online : xx xxxxx 202x

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ABSTRAK

Bioadsorben pelepah kelapa dan serbuk kayu dengan aktivator H_2PO_4 yang digunakan sebagai adsorpsi kontaminan air sungai muara Donan. Proses pembuatan karbon aktif meliputi tahapan karbonisasi dan aktivasi. Penelitian ini menggunakan variasi kombinasi terbaik dari karbon aktif berdasarkan SNI 06-3730-1995. Hasil karakteristik AC-PK 1(100) dan AC-SK 2(100) memiliki luas permukaan sebesar 110.595 m^2/g dan 35.574 m^2/g . Adsorpsi kontaminan air sungai muara Donan divariasikan dengan waktu kontak. Hasil analisis data parameter suhu, pH, TSS, dan COD disesuaikan dengan PP No.82 Tahun 2001 memenuhi baku mutu kelas III.

Kata kunci: Karbon aktif, luas permukaan pori, waktu kontak, kinetika adsorpsi.

ABSTRACT

Bioadsorbent of coconut fronds and wood powder with H_2PO_4 activator used as adsorption of Donan estuary river water contaminants. The process of making activated carbon includes the stages of carbonization and activation. This study uses the best combination variation of activated carbon based on SNI 06-3730-1995. The characteristic results of AC-PK 1(100) and AC-SK 2(100) have a surface area of 110.595 m^2/g and 35.574 m^2/g . Adsorption of Donan estuary river water contaminants was varied with contact time. The results of data analysis of temperature, pH, TSS, and COD parameters are adjusted to PP No.82 of 2001 meet the quality standards of class III.

Keywords: Activated carbon, pore surface area, contact time, adsorption kinetic.

1. Pendahuluan

Air merupakan sumber daya yang digunakan sebagai untuk memenuhi kebutuhan oleh makhluk hidup. Berdasarkan Konsentrian Lingkungan Hidup tahun 2014, sebesar 70-75% sungai di Indonesia mengalami pencemaran [1]. Salah satu sungai yang ada di Kabupaten Cilacap yaitu sungai muara Donan. Sungai ini merupakan salah satu daerah aliran sungai yang terkena dampak dari aktivitas manusia yang menyebabkan pencemaran sungai dari kawasan industri kilang minyak dan jalur penyebrangan. Berdasarkan penelitian yang telah dilakukan menyebutkan bahwa air sungai muara Donan memiliki bahan pencemar berupa **Total Suspended Solid (TSS)** sebesar 301 mg/L dan **Chemical Oxygen Demand (COD)** sebesar 31 mg/L parameter yang tidak sesuai dengan klasifikasi mutu air kelas III Peraturan Pemerintah No 82 Tahun 2001 [2]. Untuk

Lampiran 8. Biodata Penulis



Mintan Mawarni merupakan nama penulis pada penelitian Tugas Akhir dengan judul Karbon Aktif dari Pelepah Kelapa dan Serbuk Kayu Laban Sebagai Penjernih Air Sungai Muara Donan. Penulis merupakan anak pertama dari dua bersaudara dari pasangan Bapak Harjono dan Ibu Lasmini. Penulis lahir di Cilacap, 07 April 2001. Beralamat di Jalan Semadar RT 03 RW 18, Kelurahan Cilacap, Kecamatan Cilacap Selatan, Kabupaten Cilacap. Penulis dapat dihubungi melalui alamat email mintanmawarni901@gmail.com. Penulis menempuh pendidikan formal diawali di TK Masyithah (2006-2007), SD Negeri Cilacap 10 (2007-2013), dilanjutkan di SMP Negeri 4 Cilacap (2013-2016), SMK Negeri 1 Cilacap Jurusan Multimedia (2016-2019), dan Politeknik Negeri Cilacap (2019-2023) dengan Program Studi Sarjana Terapan Teknik Pengendalian Pencemaran Lingkungan. Penelitian dan penulisan laporan Tugas Akhir ditujukan sebagai syarat untuk mendapatkan gelar (S.Tr.) sekaligus sebagai penerapan ilmu yang telah didapatkan sehingga dapat meningkatkan wawasan dan kemampuan penulis khususnya pada bidang pengendalian pencemaran lingkungan.