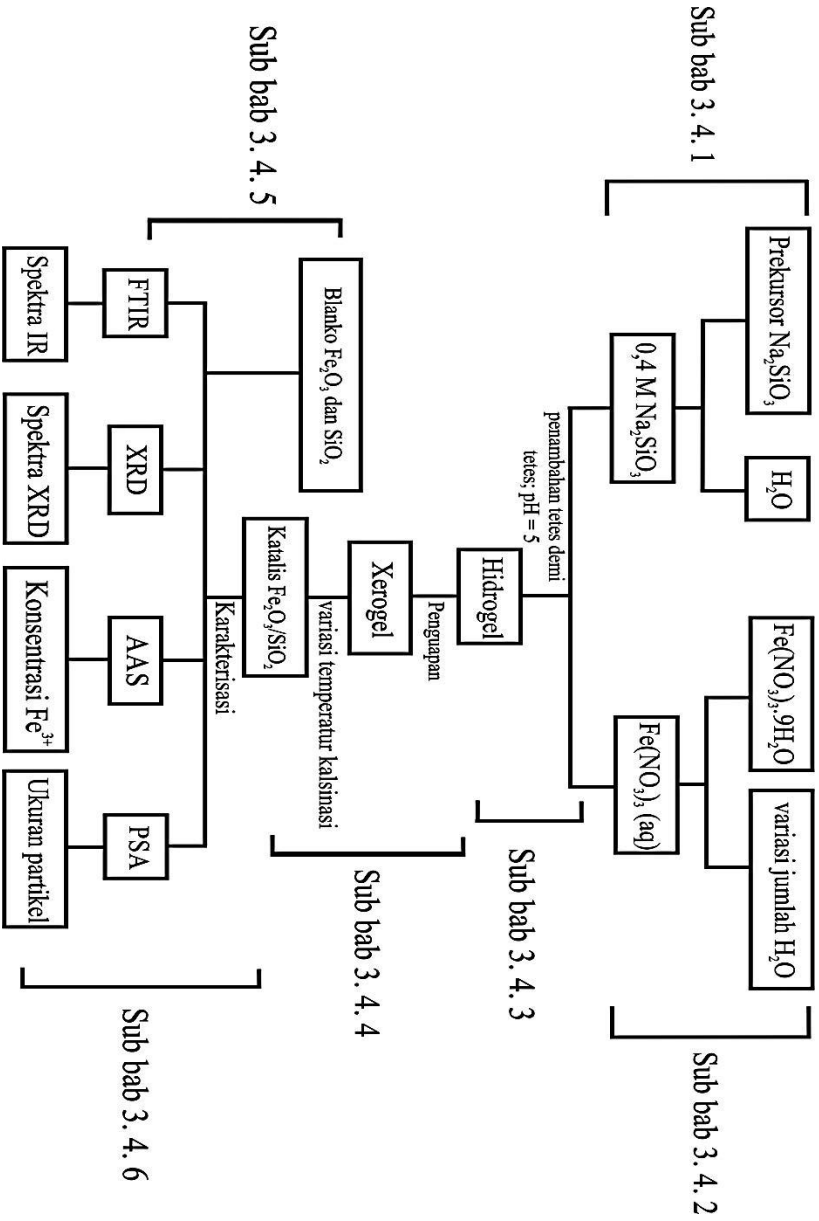


LAMPIRAN

Lampiran A. Diagram Alir Penelitian

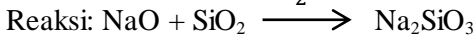


Lampiran B. Perhitungan

B.1 Perhitungan Konsentrasi Larutan Na_2SiO_3

Larutan Na_2SiO_3 diambil 2 mL kemudian dikeringkan di dalam oven dengan temperatur 110 °C hingga diperoleh massa konstan.

$$\begin{aligned}\text{Massa SiO}_2 &= \frac{\text{massa penimbangan 1} + \text{massa penimbangan 2}}{2} \\ &= \frac{1,1775 \text{ g} + 1,1775 \text{ g}}{2} = 1,1775 \text{ g}\end{aligned}$$



$$\text{mol SiO}_2 = 1,1775 \text{ g} \times \frac{1 \text{ mol}}{60,08 \text{ g}} = 0,0196 \text{ mol}$$

$$[\text{SiO}_2] = \frac{0,0196 \text{ mol}}{0,002 \text{ L}} = 9,8 \text{ M}$$

B.2 Perhitungan Pembuatan Larutan 0,87 M Na_2SiO_3

Volume larutan Na_2SiO_3 yang dibutuhkan untuk membuat 100 mL

$$0,87 \text{ M Na}_2\text{SiO}_3 = \frac{0,87 \text{ mmol}}{1 \text{ mL}} \times 100 \text{ mL} \times \frac{1 \text{ mL}}{9,8 \text{ mmol}} = 8,90 \text{ mL}$$

B.3 Perhitungan Kadar Besi dengan AAS

Tabel B.1: Absorbansi sampel katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ dengan AAS

No.	Sampel Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$	Absorbansi
1.	Kalsinasi 300 °C	0,2217
2.	Kalsinasi 400 °C	0,1367
3.	Kalsinasi 500 °C	0,0544

$$y = 0,0151x + 0,0105$$

$$\text{Ar besi} = 55,85 \text{ g/mol}$$

B.3.1 Konsentrasi Besi dalam Filtrat Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ Temperatur Kalsinasi 300 °C

$$y = 0,0151x + 0,0105$$

$$0,2217 - 0,0105 = 0,0151x$$

$$0,2112 = 0,0151x$$

$$x = 13,9868 \text{ ppm}$$

$$\begin{aligned}\text{Konsentrasi besi (ppm)} &= 13,9868 \text{ ppm} \times \text{faktor pengenceran} \\ &= 13,9868 \text{ ppm} \times 200 \\ &= 2797,36 \text{ ppm}\end{aligned}$$

$$\begin{aligned}\text{Konsentrasi besi (M)} &= 2797,36 \frac{\text{mg}}{\text{L}} \times \frac{1 \text{ mmol}}{55,85 \text{ mg}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \\ &= 0,05 \text{ M}\end{aligned}$$

B.3.2 Konsentrasi Besi dalam Filtrat Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ Temperatur Kalsinasi 400 °C

$$y = 0,0151x + 0,0105$$

$$0,1367 - 0,0105 = 0,0151x$$

$$0,1262 = 0,0151x$$

$$x = 8,3576 \text{ ppm}$$

$$\begin{aligned} \text{Konsentrasi besi (ppm)} &= 8,3576 \text{ ppm} \times \text{faktor pengenceran} \\ &= 8,3576 \text{ ppm} \times 200 \\ &= 1671,52 \text{ ppm} \end{aligned}$$

$$\begin{aligned} \text{Konsentrasi besi (M)} &= 1671,52 \frac{\text{mg}}{\text{L}} \times \frac{1 \text{ mmol}}{55,85 \text{ mg}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \\ &= 0,029 \text{ M} \end{aligned}$$

B.3.3 Konsentrasi Besi dalam Filtrat Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ Temperatur Kalsinasi 500°C

$$y = 0,0151x + 0,0105$$

$$0,0544 - 0,0105 = 0,0151x$$

$$0,0439 = 0,0151x$$

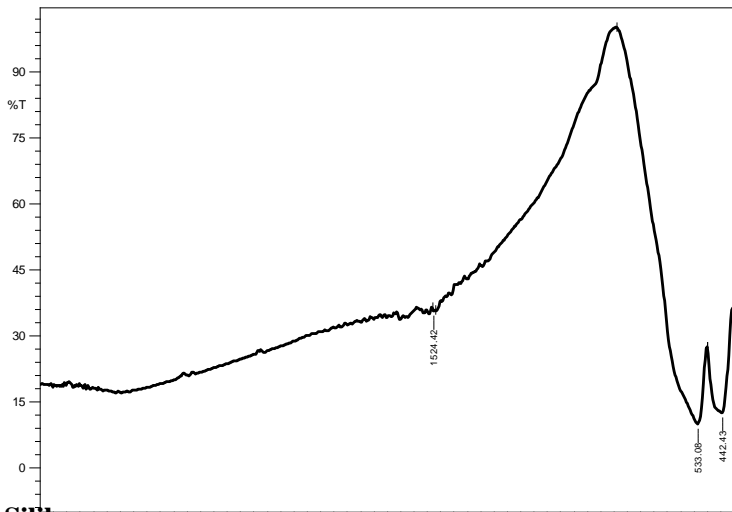
$$x = 2,9073 \text{ ppm}$$

$$\begin{aligned} \text{Konsentrasi besi (ppm)} &= 2,9073 \text{ ppm} \times \text{faktor pengenceran} \\ &= 2,9073 \text{ ppm} \times 200 \\ &= 581,46 \text{ ppm} \end{aligned}$$

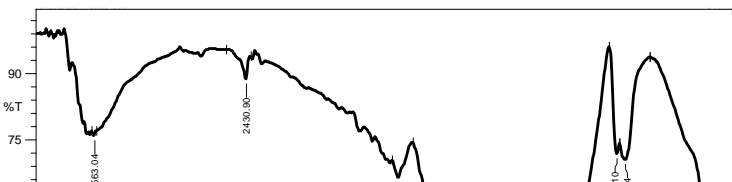
$$\begin{aligned} \text{Konsentrasi besi (M)} &= 581,46 \frac{\text{mg}}{\text{L}} \times \frac{1 \text{ mmol}}{55,85 \text{ mg}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \\ &= 0,01 \text{ M} \end{aligned}$$

Lampiran C. Hasil Karakterisasi dengan FTIR

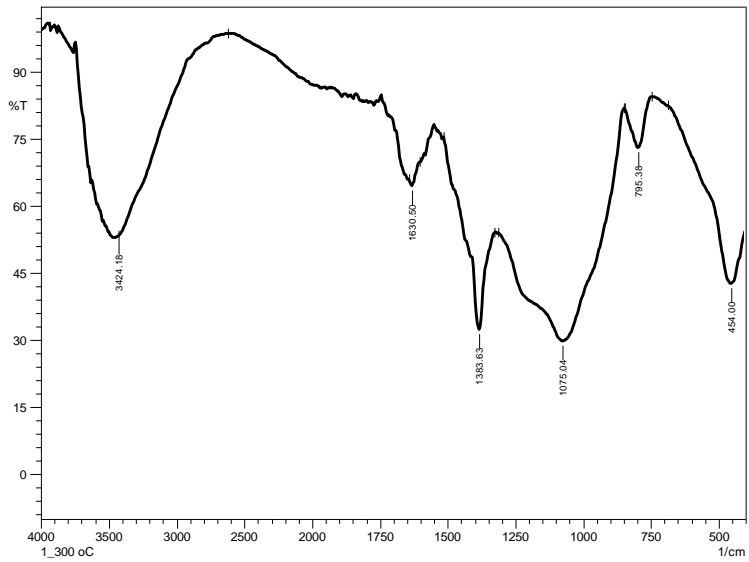
C.1. Fe_2O_3



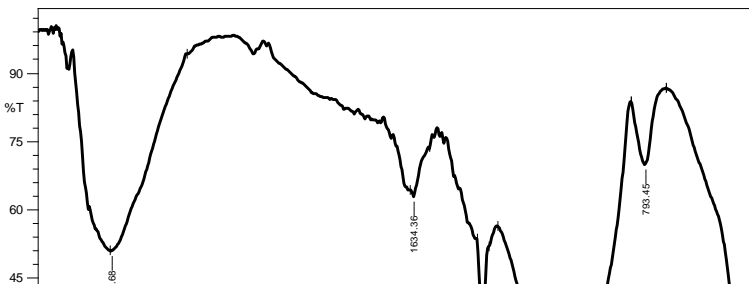
C.2 Silika



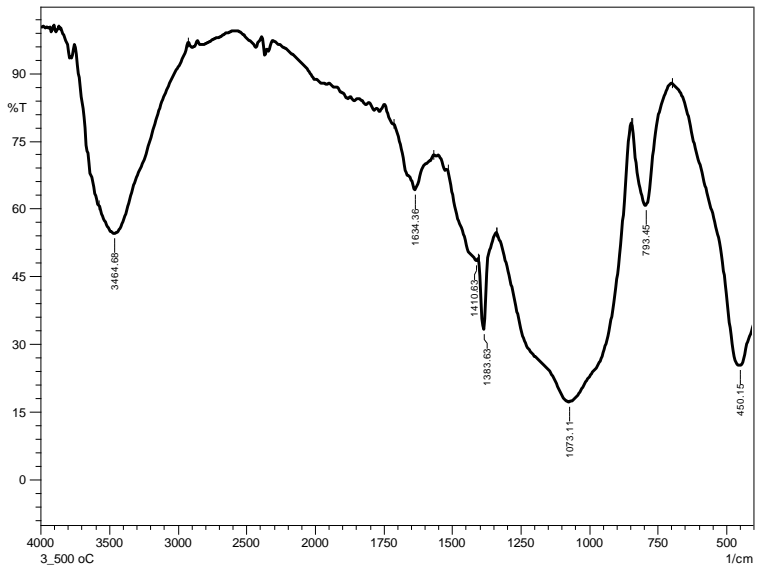
C.3 Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada 300 °C



C.4 Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada 400 °C

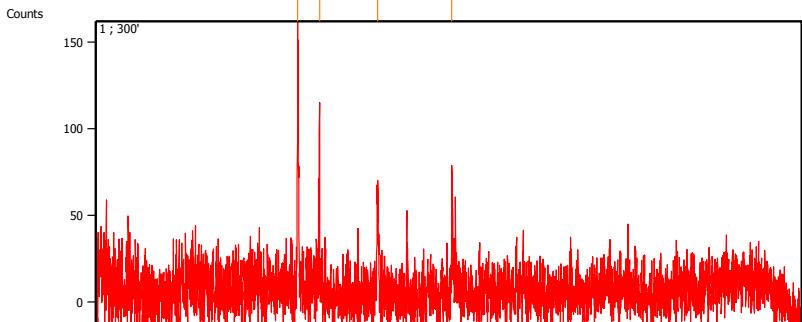


C.5 Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada 500 °C

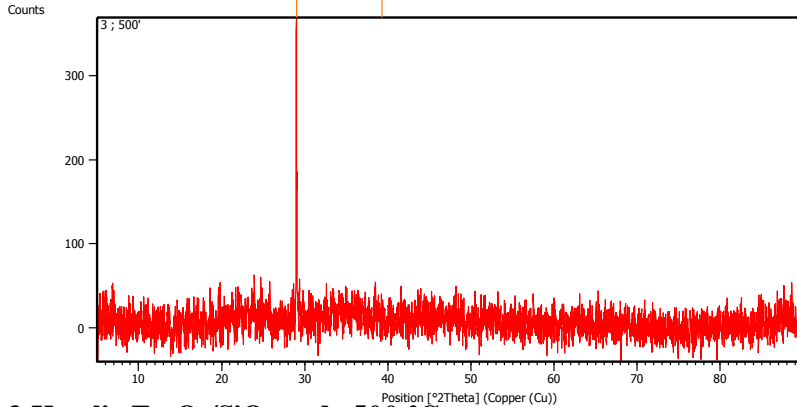


Lampiran D. Hasil Karakterisasi dengan XRD

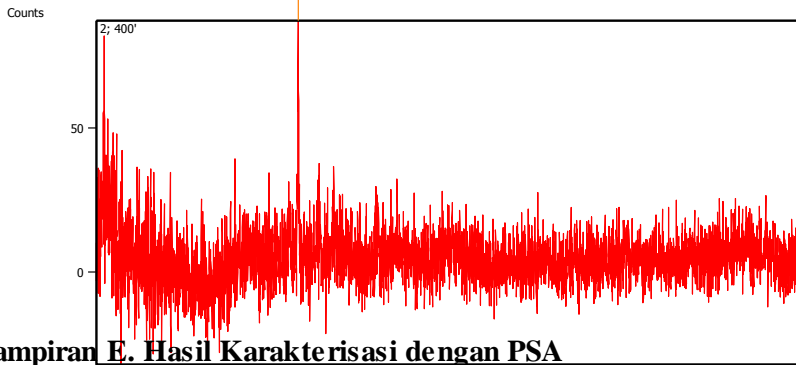
D.1 Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada 300 °C



D.2 Katalis Fe₂O₃/SiO₂ pada 400 °C



D.3 Katalis Fe₂O₃/SiO₂ pada 500 °C

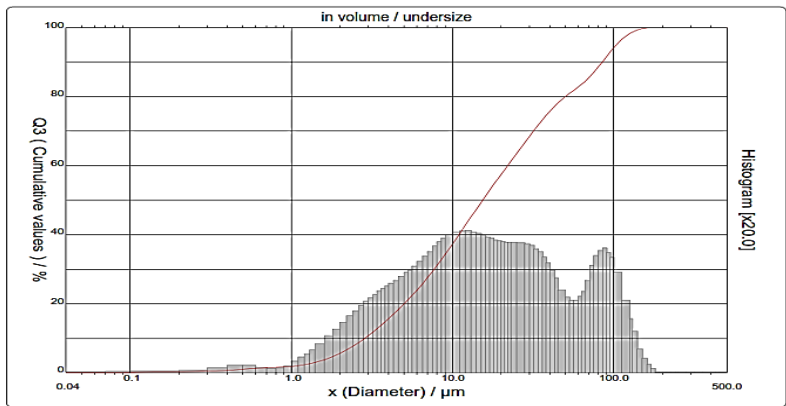


Lampiran E. Hasil Karakterisasi dengan PSA

E.1 Katalis Fe₂O₃/SiO₂ pada 300 °C

Tabel E.2: Data ukuran partikel katalis Fe₂O₃/SiO₂ pada 300 °C

x	0.04	0.07	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80
Q3	0.00	0.07	0.13	0.31	0.47	0.74	1.07	1.33	1.49	1.60
q3	0.00	0.01	0.01	0.02	0.03	0.06	0.10	0.10	0.07	0.06
x	0.90	1.00	1.10	1.20	1.30	1.40	1.60	1.80	2.00	2.20
Q3	1.71	1.85	2.07	2.35	2.66	3.01	3.81	4.71	5.67	6.67
q3	0.06	0.09	0.16	0.22	0.27	0.33	0.41	0.53	0.63	0.72
x	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.30
Q3	7.70	8.73	9.77	10.80	11.81	12.80	13.78	14.73	15.66	17.01
q3	0.82	0.89	0.97	1.03	1.08	1.13	1.18	1.21	1.25	1.29
x	4.60	5.00	5.30	5.60	6.00	6.50	7.00	7.50	8.00	8.50
Q3	18.31	19.99	21.21	22.39	23.93	25.79	27.60	29.35	31.06	32.72
q3	1.33	1.39	1.44	1.48	1.54	1.60	1.69	1.75	1.83	1.89
x	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00
Q3	34.33	37.38	40.19	42.77	45.15	47.33	49.34	51.20	52.92	54.53
q3	1.94	2.00	2.03	2.05	2.05	2.03	2.01	1.99	1.96	1.94
x	19.00	20.00	21.00	22.00	23.00	25.00	28.00	30.00	32.00	34.00

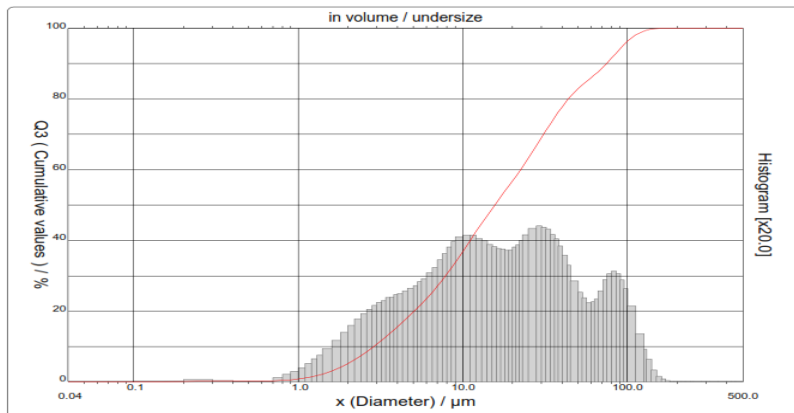


Gambar E.1: Histogram ukuran partikel katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $300\text{ }^\circ\text{C}$

E.2 Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $400\text{ }^\circ\text{C}$

Tabel E.3: Data ukuran partikel katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $400\text{ }^\circ\text{C}$

x	0.04	0.07	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80
Q3	0.09	0.09	0.09	0.18	0.33	0.37	0.37	0.37	0.37	0.47
q3	0.00	0.00	0.00	0.01	0.03	0.01	0.00	0.00	0.00	0.05
x	0.90	1.00	1.10	1.20	1.30	1.40	1.60	1.80	2.00	2.20
Q3	0.64	0.86	1.13	1.45	1.82	2.22	3.12	4.12	5.18	6.28
q3	0.10	0.14	0.19	0.25	0.32	0.37	0.46	0.58	0.69	0.79
x	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.30
Q3	7.40	8.52	9.62	10.70	11.75	12.76	13.75	14.69	15.61	16.92
q3	0.88	0.96	1.02	1.07	1.12	1.14	1.19	1.19	1.23	1.24
x	4.60	5.00	5.30	5.60	6.00	6.50	7.00	7.50	8.00	8.50
Q3	18.18	19.78	20.93	22.06	23.52	25.31	27.05	28.78	30.48	32.16
q3	1.28	1.32	1.35	1.41	1.45	1.53	1.61	1.72	1.81	1.90
x	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00
Q3	33.81	36.95	39.82	42.44	44.80	46.95	48.90	50.69	52.35	53.91
q3	1.98	2.04	2.06	2.06	2.02	1.99	1.94	1.90	1.88	1.87
x	19.00	20.00	21.00	22.00	23.00	25.00	28.00	30.00	32.00	34.00
Q3	55.37	56.76	58.11	59.42	60.71	63.23	66.80	69.01	71.06	72.96
q3	1.85	1.86	1.90	1.93	1.99	2.07	2.16	2.20	2.18	2.15
x	36.00	38.00	40.00	43.00	45.00	50.00	53.00	56.00	60.00	63.00
Q3	74.69	76.28	77.71	79.59	80.68	82.86	83.93	84.88	86.00	86.80
q3	2.03	2.03	2.04	2.05	2.04	2.03	2.02	2.01	2.00	1.99

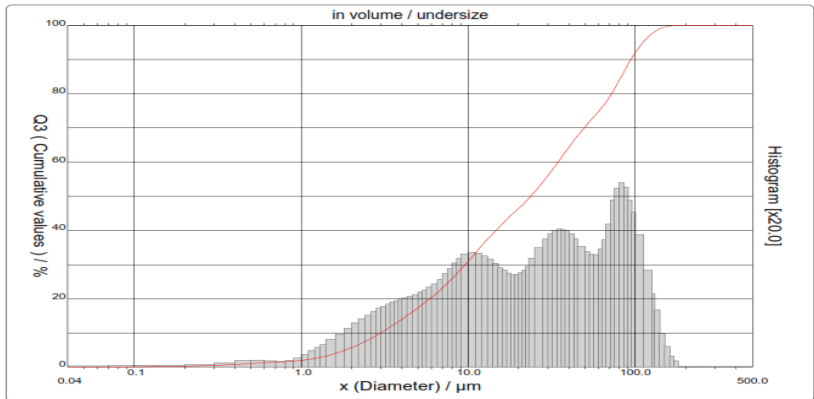


Gambar E.2: Histogram ukuran partikel katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $400\text{ }^\circ\text{C}$

E.3 Katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $500\text{ }^\circ\text{C}$

Tabel E.3: Data ukuran partikel katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $500\text{ }^\circ\text{C}$

x	0.04	0.07	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80
Q3	0.00	0.08	0.16	0.35	0.54	0.79	1.08	1.33	1.52	1.67
q3	0.00	0.01	0.02	0.02	0.03	0.06	0.09	0.09	0.08	0.08
x	0.90	1.00	1.10	1.20	1.30	1.40	1.60	1.80	2.00	2.20
Q3	1.83	2.03	2.28	2.58	2.91	3.26	4.04	4.86	5.72	6.61
q3	0.09	0.13	0.18	0.24	0.28	0.32	0.40	0.48	0.56	0.64
x	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.30
Q3	7.50	8.38	9.25	10.11	10.94	11.75	12.54	13.30	14.04	15.10
q3	0.70	0.75	0.80	0.85	0.88	0.92	0.95	0.96	0.99	1.00
x	4.60	5.00	5.30	5.60	6.00	6.50	7.00	7.50	8.00	8.50
Q3	16.11	17.39	18.32	19.22	20.39	21.80	23.18	24.55	25.90	27.24
q3	1.03	1.05	1.09	1.12	1.16	1.21	1.28	1.36	1.43	1.52
x	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00
Q3	28.56	31.09	33.41	35.52	37.41	39.11	40.63	41.99	43.24	44.38
q3	1.58	1.65	1.67	1.66	1.62	1.57	1.51	1.44	1.41	1.37
x	19.00	20.00	21.00	22.00	23.00	25.00	28.00	30.00	32.00	34.00
Q3	45.44	46.45	47.43	48.39	49.34	51.27	54.15	56.03	57.86	59.62
q3	1.34	1.35	1.38	1.41	1.47	1.59	1.74	1.87	1.94	1.99
x	36.00	38.00	40.00	43.00	45.00	50.00	53.00	56.00	60.00	63.00
Q3	61.30	62.88	64.37	66.42	67.66	70.36	71.79	73.11	74.76	75.99
q3	2.02	2.00	1.99	1.94	1.87	1.76	1.68	1.64	1.64	1.73
x	66.00	71.00	75.00	80.00	85.00	90.00	95.00	100.00	112.00	125.00
Q3	77.25	79.47	81.42	83.88	86.26	88.45	90.37	92.06	95.25	97.51

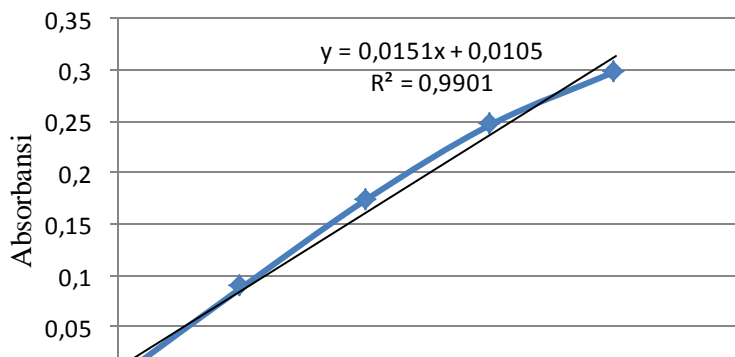


Gambar E.3: Histogram ukuran partikel katalis $\text{Fe}_2\text{O}_3/\text{SiO}_2$ pada $500\text{ }^\circ\text{C}$

Lampiran F. Kurva Baku Fe^{3+}

Tabel F.2: Data Absorbansi Larutan Standar Fe^{3+}

Konsentrasi (ppm)	Absorbansi
0	0
5	0,0886
10	0,1742
15	0,2471
20	0,2987



Gambar F.4: Kurva Standar Larutan Fe³⁺

Lampiran G. Data Pendukung

Tabel G.3: JCPDS α -Fe₂O₃ (JCPDS No. 33-664)

d (Å)	Intensitas (%)	h	k	l
3,6840	30	0,00	1,00	2,00
2,7000	100	1,00	0,00	4,00
2,5190	70	1,00	1,00	0,00
2,2920	3	0,00	0,00	6,00
2,2070	20	1,00	1,00	3,00
2,0779	3	2,00	0,00	2,00
1,8406	40	0,00	2,00	4,00
1,6941	45	1,00	1,00	6,00
1,6367	1	2,00	1,00	1,00
1,6033	5	1,00	2,00	2,00
1,5992	10	0,00	1,00	8,00
1,4859	30	2,00	1,00	4,00