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LAMPIRAN - LAMPIRAN

Lampiran 1. Dokumentasi



(Preparasi Kaleng Minuman Bekas)



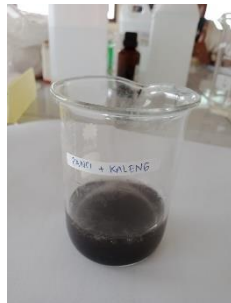
(Preparasi Panci Bekas)



(Proses Pelarutan)



(Proses Ekstraksi)



(Hasil Pelarutan Panci + Kaleng)



(Hasil Pelarutan Panci)



(Residu bahan A)



(Residu bahan B)



(Proses Pencucian Koagulan)



(Pembuatan larutan KOH)



(Proses Kristalisasi)



(Proses Pengeringan)



(Penimbangan untuk mendapatkan berat konstan koagulan)



(Sampel untuk pengujian karakteristik koagulan menggunakan XRF)



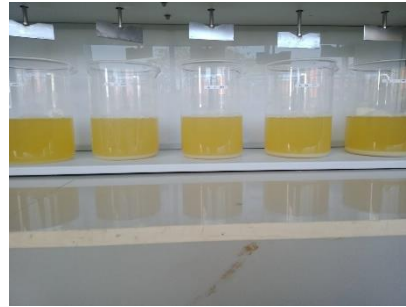
(Pengukuran pH air limbah)



(Penambahan larutan alkali)



(Proses Koagulasi Flokulasi)



(Pengendapan)



(Pengukuran Kekeruhan)



(Analisis COD)

Lampiran 2. Perhitungan Proses Sintesis Koagulan

Pembuatan Larutan KOH

$$1. \quad \%(\mathbf{m/m}) = \frac{\mathbf{massa\ KOH}}{\mathbf{massa\ KOH+air}}$$

$$20\% = \frac{\mathbf{massa\ KOH}}{100\ \mathbf{gram}}$$

$$\mathbf{massa\ KOH} = 20\ \mathbf{gram}$$

$$2. \quad \%(\mathbf{m/m}) = \frac{\mathbf{massa\ KOH}}{\mathbf{massa\ KOH+air}}$$

$$30\% = \frac{\mathbf{massa\ KOH}}{100\ \mathbf{gram}}$$

$$\mathbf{massa\ KOH} = 30\ \mathbf{gram}$$

$$3. \quad \%(\mathbf{m/m}) = \frac{\mathbf{massa\ KOH}}{\mathbf{massa\ KOH+air}}$$

$$40\% = \frac{\mathbf{massa\ KOH}}{100\ \mathbf{gram}}$$

$$\mathbf{massa\ KOH} = 40\ \mathbf{gram}$$

Pembuatan Larutan H₂SO₄

$$\text{Konsentrasi H}_2\text{SO}_4 = 98\%$$

$$\rho \text{ H}_2\text{SO}_4 = 1,8\ \text{g/cm}^3$$

$$\text{BM H}_2\text{SO}_4 = 98\ \text{g/mol}$$

$$M \text{ H}_2\text{SO}_4 = \frac{10 \times \% \times \rho}{\text{BM}}$$

$$M \text{ H}_2\text{SO}_4 = \frac{10 \times 98 \times 1,8\ \text{g/cm}^3}{98\ \text{g/mol}}$$

$$M \text{ H}_2\text{SO}_4 = 18\ \text{M}$$

$$M_1 \times V_1 = M_2 \times V_2$$

$$18\ \text{M} \times V_1 = 8\ \text{M} \times 100\ \text{mL}$$

$$V_1 = 44,4\ \text{mL}$$

$$V_1 = 44\ \text{mL}$$

Perhitungan %Rendemen

$$\text{Mr Al} = 26,9815 \text{ g/mol}$$

$$\text{Mr KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O} = 474,399 \text{ g/mol}$$

$$\text{Massa Al bereaksi} = 1 \text{ g}$$

$$\text{mol Al} = \frac{\text{massa Al bereaksi}}{\text{Mr Al}} = \frac{1 \text{ g}}{26,9815 \text{ g/mol}} = 0,0370 \text{ mol}$$

$$\begin{aligned} \text{Theoretical yield of alum} &= \text{mol} \times \text{Mr KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O} \\ &= 0,0370 \text{ mol} \times 474,39 \text{ g/mol} \\ &= 17,55243 \text{ g} \end{aligned}$$

$$\text{Percent yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$$

1. A1

$$\text{Actual yield} = 9,3 \text{ g}$$

$$\begin{aligned} \text{Percent yield} &= \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% \\ &= \frac{9,3 \text{ g}}{17,55234 \text{ g}} \times 100\% \\ &= 52,98\% \end{aligned}$$

2. A2

$$\text{Actual yield} = 21,1065 \text{ g}$$

$$\begin{aligned} \text{Percent yield} &= \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% \\ &= \frac{21,1065 \text{ g}}{17,55234 \text{ g}} \times 100\% \\ &= 120,24\% \end{aligned}$$

3. A3

$$\text{Actual yield} = 23,569 \text{ g}$$

$$\begin{aligned} \text{Percent yield} &= \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% \\ &= \frac{23,569 \text{ g}}{17,55234 \text{ g}} \times 100\% \\ &= 134,27\% \end{aligned}$$

4. B1

Actual yield = 11,09 g

$$\begin{aligned} \text{Percent yield} &= \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% \\ &= \frac{11,09 \text{ g}}{17,55234 \text{ g}} \times 100\% \\ &= 63,18\% \end{aligned}$$

5. B2

Actual yield = 13,5105 g

$$\begin{aligned} \text{Percent yield} &= \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% \\ &= \frac{13,5105 \text{ g}}{17,55234 \text{ g}} \times 100\% \\ &= 76,97\% \end{aligned}$$

6. B3

Actual yield = 21,5636 g

$$\begin{aligned} \text{Percent yield} &= \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\% \\ &= \frac{21,5636 \text{ g}}{17,55234 \text{ g}} \times 100\% \\ &= 122,85\% \end{aligned}$$

Perhitungan Bagian yang Tidak Larut dalam Air

$$\text{Bagian yang tidak larut dalam air \%} = \frac{W1 - W2}{W} \times 100\%$$

Sampel	W (g)	W1 (g)	W2 (g)	Bagian Tidak Larut dalam Air (%)
A1	0,5	0,5407	0,5288	0,0238
A2		0,5632	0,5572	0,012
A3		0,5619	0,5496	0,0246
B1		0,5523	0,5467	0,0112
B2		0,5605	0,5548	0,0114
B3		0,5703	0,5597	0,0212
k		0,5614	0,5527	0,0174

Konversi Dosis Koagulan

$$\frac{1 \text{ gram}}{500 \text{ mL}} = \frac{1000 \text{ mg}}{0,5 \text{ L}} = 2000 \text{ mg/L}$$

$$\frac{1,5 \text{ gram}}{500 \text{ mL}} = \frac{1500 \text{ mg}}{0,5 \text{ L}} = 3000 \text{ mg/L}$$

$$\frac{2 \text{ gram}}{500 \text{ mL}} = \frac{2000 \text{ mg}}{0,5 \text{ L}} = 4000 \text{ mg/L}$$

$$\frac{2,5 \text{ gram}}{500 \text{ mL}} = \frac{2500 \text{ mg}}{0,5 \text{ L}} = 5000 \text{ mg/L}$$

$$\frac{3 \text{ gram}}{500 \text{ mL}} = \frac{3000 \text{ mg}}{0,5 \text{ L}} = 6000 \text{ mg/L}$$

Lampiran 3. Data Hasil Pengujian Karakteristik Koagulan

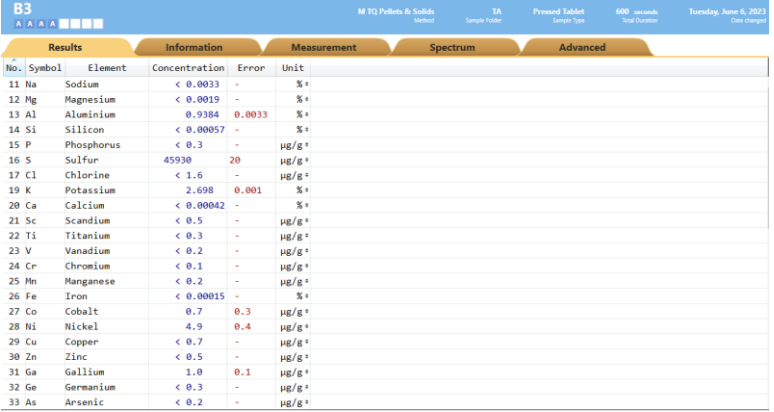
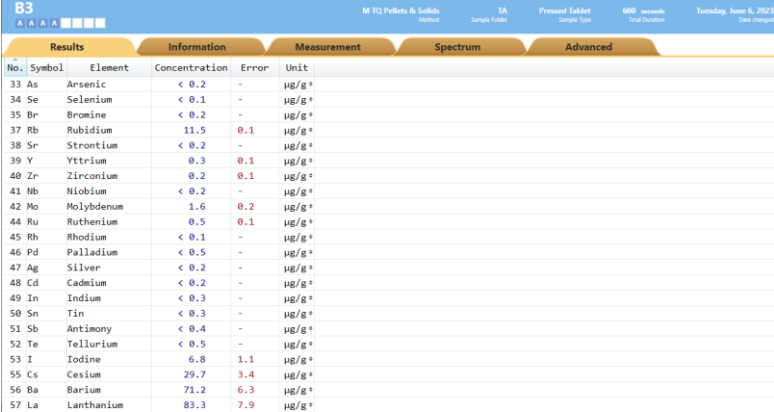

Sampel	Hasil Pengujian																																																																																																																																																																																																																																																																																																																																																																																																																																																
<p>A1 (Panci bekas dengan KOH 20%)</p>	<div> <p>RESULTS</p> <p>A1</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Symbol</th> <th>Element</th> <th>Concentration</th> <th>Error</th> <th>Unit</th> </tr> </thead> <tbody> <tr><td>16</td><td>S</td><td>Sulfur</td><td>1529</td><td>4</td><td>µg/g °</td></tr> <tr><td>13</td><td>Al</td><td>Aluminium</td><td>0.05379</td><td>0.00078</td><td>% °</td></tr> <tr><td>58</td><td>Ce</td><td>Cerium</td><td>144</td><td>14</td><td>µg/g °</td></tr> <tr><td>57</td><td>La</td><td>Lanthanium</td><td>113.2</td><td>9.4</td><td>µg/g °</td></tr> <tr><td>56</td><td>Ba</td><td>Barium</td><td>84.5</td><td>7.0</td><td>µg/g °</td></tr> <tr><td>55</td><td>Cs</td><td>Cesium</td><td>39.7</td><td>4.1</td><td>µg/g °</td></tr> <tr><td>28</td><td>Ni</td><td>Nickel</td><td>22.7</td><td>0.5</td><td>µg/g °</td></tr> <tr><td>53</td><td>I</td><td>Iodine</td><td>10.9</td><td>1.5</td><td>µg/g °</td></tr> <tr><td>37</td><td>Rb</td><td>Rubidium</td><td>9.1</td><td>0.1</td><td>µg/g °</td></tr> <tr><td>27</td><td>Co</td><td>Cobalt</td><td>1.7</td><td>0.2</td><td>µg/g °</td></tr> <tr><td>48</td><td>Cd</td><td>Cadmium</td><td>0.7</td><td>0.4</td><td>µg/g °</td></tr> <tr><td>39</td><td>Y</td><td>Yttrium</td><td>0.6</td><td>0.1</td><td>µg/g °</td></tr> <tr><td>44</td><td>Ru</td><td>Ruthenium</td><td>0.3</td><td>0.1</td><td>µg/g °</td></tr> <tr><td>12</td><td>Mg</td><td>Magnesium</td><td>< 0.0012</td><td>-</td><td>% °</td></tr> <tr><td>11</td><td>Na</td><td>Sodium</td><td>< 0.00093</td><td>-</td><td>% °</td></tr> <tr><td>52</td><td>Te</td><td>Tellurium</td><td>< 3.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>26</td><td>Fe</td><td>Iron</td><td>< 0.00013</td><td>-</td><td>% °</td></tr> <tr><td>14</td><td>Si</td><td>Silicon</td><td>< 0.00011</td><td>-</td><td>% °</td></tr> <tr><td>17</td><td>Cl</td><td>Chlorine</td><td>< 1.0</td><td>-</td><td>µg/g °</td></tr> <tr><td>19</td><td>K</td><td>Potassium</td><td>< 0.00009</td><td>-</td><td>% °</td></tr> <tr><td>73</td><td>Ta</td><td>Tantalum</td><td>< 0.8</td><td>-</td><td>µg/g °</td></tr> <tr><td>20</td><td>Ca</td><td>Calcium</td><td>< 0.00008</td><td>-</td><td>% °</td></tr> <tr><td>15</td><td>P</td><td>Phosphorus</td><td>< 0.8</td><td>-</td><td>µg/g °</td></tr> </tbody> </table> </div> <div> <p>RESULTS</p> <p>A1</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Symbol</th> <th>Element</th> <th>Concentration</th> <th>Error</th> <th>Unit</th> </tr> </thead> <tbody> <tr><td>15</td><td>P</td><td>Phosphorus</td><td>< 0.8</td><td>-</td><td>µg/g °</td></tr> <tr><td>29</td><td>Cu</td><td>Copper</td><td>< 0.7</td><td>-</td><td>µg/g °</td></tr> <tr><td>30</td><td>Zn</td><td>Zinc</td><td>< 0.5</td><td>-</td><td>µg/g °</td></tr> <tr><td>74</td><td>W</td><td>Tungsten</td><td>< 0.5</td><td>-</td><td>µg/g °</td></tr> <tr><td>21</td><td>Sc</td><td>Scandium</td><td>< 0.5</td><td>-</td><td>µg/g °</td></tr> <tr><td>46</td><td>Pd</td><td>Palladium</td><td>< 0.5</td><td>-</td><td>µg/g °</td></tr> <tr><td>70</td><td>Yb</td><td>Ytterbium</td><td>< 0.4</td><td>-</td><td>µg/g °</td></tr> <tr><td>31</td><td>Ga</td><td>Gallium</td><td>< 0.4</td><td>-</td><td>µg/g °</td></tr> <tr><td>51</td><td>Sb</td><td>Antimony</td><td>< 0.4</td><td>-</td><td>µg/g °</td></tr> <tr><td>22</td><td>Ti</td><td>Titanium</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>83</td><td>Bi</td><td>Bismuth</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>82</td><td>Pb</td><td>Lead</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>32</td><td>Ge</td><td>Germanium</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>49</td><td>In</td><td>Indium</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>50</td><td>Sn</td><td>Tin</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>72</td><td>Hf</td><td>Hafnium</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>81</td><td>Tl</td><td>Thallium</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>79</td><td>Au</td><td>Gold</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>23</td><td>V</td><td>Vanadium</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>25</td><td>Mn</td><td>Manganese</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>33</td><td>As</td><td>Arsenic</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>35</td><td>Br</td><td>Bromine</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>47</td><td>Ag</td><td>Silver</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> </tbody> </table> </div> <div> <p>RESULTS</p> <p>A1</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Symbol</th> <th>Element</th> <th>Concentration</th> <th>Error</th> <th>Unit</th> </tr> </thead> <tbody> <tr><td>82</td><td>Pb</td><td>Lead</td><td>< 0.3</td><td>-</td><td>µg/g °</td></tr> <tr><td>32</td><td>Ge</td><td>Germanium</td><td>< 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<tr><td>38</td><td>Sr</td><td>Strontium</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>41</td><td>Nb</td><td>Niobium</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>40</td><td>Zr</td><td>Zirconium</td><td>< 0.2</td><td>-</td><td>µg/g °</td></tr> <tr><td>80</td><td>Hg</td><td>Mercury</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>92</td><td>U</td><td>Uranium</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>34</td><td>Se</td><td>Selenium</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>24</td><td>Cr</td><td>Chromium</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>78</td><td>Pt</td><td>Platinum</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>90</td><td>Th</td><td>Thorium</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> <tr><td>45</td><td>Rh</td><td>Rhodium</td><td>< 0.1</td><td>-</td><td>µg/g °</td></tr> </tbody> </table> </div>	No.	Symbol	Element	Concentration	Error	Unit	16	S	Sulfur	1529	4	µg/g °	13	Al	Aluminium	0.05379	0.00078	% °	58	Ce	Cerium	144	14	µg/g °	57	La	Lanthanium	113.2	9.4	µg/g °	56	Ba	Barium	84.5	7.0	µg/g °	55	Cs	Cesium	39.7	4.1	µg/g °	28	Ni	Nickel	22.7	0.5	µg/g °	53	I	Iodine	10.9	1.5	µg/g °	37	Rb	Rubidium	9.1	0.1	µg/g °	27	Co	Cobalt	1.7	0.2	µg/g °	48	Cd	Cadmium	0.7	0.4	µg/g °	39	Y	Yttrium	0.6	0.1	µg/g °	44	Ru	Ruthenium	0.3	0.1	µg/g °	12	Mg	Magnesium	< 0.0012	-	% °	11	Na	Sodium	< 0.00093	-	% °	52	Te	Tellurium	< 3.1	-	µg/g °	26	Fe	Iron	< 0.00013	-	% °	14	Si	Silicon	< 0.00011	-	% °	17	Cl	Chlorine	< 1.0	-	µg/g °	19	K	Potassium	< 0.00009	-	% °	73	Ta	Tantalum	< 0.8	-	µg/g °	20	Ca	Calcium	< 0.00008	-	% °	15	P	Phosphorus	< 0.8	-	µg/g °	No.	Symbol	Element	Concentration	Error	Unit	15	P	Phosphorus	< 0.8	-	µg/g °	29	Cu	Copper	< 0.7	-	µg/g °	30	Zn	Zinc	< 0.5	-	µg/g °	74	W	Tungsten	< 0.5	-	µg/g °	21	Sc	Scandium	< 0.5	-	µg/g °	46	Pd	Palladium	< 0.5	-	µg/g °	70	Yb	Ytterbium	< 0.4	-	µg/g °	31	Ga	Gallium	< 0.4	-	µg/g °	51	Sb	Antimony	< 0.4	-	µg/g °	22	Ti	Titanium	< 0.3	-	µg/g °	83	Bi	Bismuth	< 0.3	-	µg/g °	82	Pb	Lead	< 0.3	-	µg/g °	32	Ge	Germanium	< 0.3	-	µg/g °	49	In	Indium	< 0.3	-	µg/g °	50	Sn	Tin	< 0.3	-	µg/g °	72	Hf	Hafnium	< 0.2	-	µg/g °	81	Tl	Thallium	< 0.2	-	µg/g °	79	Au	Gold	< 0.2	-	µg/g °	23	V	Vanadium	< 0.2	-	µg/g °	25	Mn	Manganese	< 0.2	-	µg/g °	33	As	Arsenic	< 0.2	-	µg/g °	35	Br	Bromine	< 0.2	-	µg/g °	47	Ag	Silver	< 0.2	-	µg/g °	No.	Symbol	Element	Concentration	Error	Unit	82	Pb	Lead	< 0.3	-	µg/g °	32	Ge	Germanium	< 0.3	-	µg/g °	49	In	Indium	< 0.3	-	µg/g °	50	Sn	Tin	< 0.3	-	µg/g °	72	Hf	Hafnium	< 0.2	-	µg/g °	81	Tl	Thallium	< 0.2	-	µg/g °	79	Au	Gold	< 0.2	-	µg/g °	23	V	Vanadium	< 0.2	-	µg/g °	25	Mn	Manganese	< 0.2	-	µg/g °	33	As	Arsenic	< 0.2	-	µg/g °	35	Br	Bromine	< 0.2	-	µg/g °	47	Ag	Silver	< 0.2	-	µg/g °	42	Mo	Molybdenum	< 0.2	-	µg/g °	38	Sr	Strontium	< 0.2	-	µg/g °	41	Nb	Niobium	< 0.2	-	µg/g °	40	Zr	Zirconium	< 0.2	-	µg/g °	80	Hg	Mercury	< 0.1	-	µg/g °	92	U	Uranium	< 0.1	-	µg/g °	34	Se	Selenium	< 0.1	-	µg/g °	24	Cr	Chromium	< 0.1	-	µg/g °	78	Pt	Platinum	< 0.1	-	µg/g °	90	Th	Thorium	< 0.1	-	µg/g °	45	Rh	Rhodium	< 0.1	-	µg/g °
No.	Symbol	Element	Concentration	Error	Unit																																																																																																																																																																																																																																																																																																																																																																																																																																												
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56	Ba	Barium	84.5	7.0	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
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28	Ni	Nickel	22.7	0.5	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
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27	Co	Cobalt	1.7	0.2	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
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39	Y	Yttrium	0.6	0.1	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
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26	Fe	Iron	< 0.00013	-	% °																																																																																																																																																																																																																																																																																																																																																																																																																																												
14	Si	Silicon	< 0.00011	-	% °																																																																																																																																																																																																																																																																																																																																																																																																																																												
17	Cl	Chlorine	< 1.0	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
19	K	Potassium	< 0.00009	-	% °																																																																																																																																																																																																																																																																																																																																																																																																																																												
73	Ta	Tantalum	< 0.8	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
20	Ca	Calcium	< 0.00008	-	% °																																																																																																																																																																																																																																																																																																																																																																																																																																												
15	P	Phosphorus	< 0.8	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
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29	Cu	Copper	< 0.7	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
30	Zn	Zinc	< 0.5	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
74	W	Tungsten	< 0.5	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
21	Sc	Scandium	< 0.5	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
46	Pd	Palladium	< 0.5	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
70	Yb	Ytterbium	< 0.4	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
31	Ga	Gallium	< 0.4	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
51	Sb	Antimony	< 0.4	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
22	Ti	Titanium	< 0.3	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
83	Bi	Bismuth	< 0.3	-	µg/g °																																																																																																																																																																																																																																																																																																																																																																																																																																												
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<tr><td>19</td><td>K</td><td>Potassium</td><td>1.906</td><td>0.001</td><td>%</td></tr> <tr><td>20</td><td>Ca</td><td>Calcium</td><td>0.00070</td><td>0.00021</td><td>%</td></tr> <tr><td>21</td><td>Sc</td><td>Scandium</td><td>< 0.5</td><td>-</td><td>µg/g</td></tr> <tr><td>22</td><td>Ti</td><td>Titanium</td><td>0.6</td><td>0.1</td><td>µg/g</td></tr> <tr><td>23</td><td>V</td><td>Vanadium</td><td>< 0.2</td><td>-</td><td>µg/g</td></tr> <tr><td>24</td><td>Cr</td><td>Chromium</td><td>0.4</td><td>0.1</td><td>µg/g</td></tr> <tr><td>25</td><td>Mn</td><td>Manganese</td><td>< 0.2</td><td>-</td><td>µg/g</td></tr> <tr><td>26</td><td>Fe</td><td>Iron</td><td>0.00259</td><td>0.00004</td><td>%</td></tr> <tr><td>27</td><td>Co</td><td>Cobalt</td><td>0.4</td><td>0.2</td><td>µg/g</td></tr> <tr><td>28</td><td>Ni</td><td>Nickel</td><td>< 0.8</td><td>-</td><td>µg/g</td></tr> <tr><td>29</td><td>Cu</td><td>Copper</td><td>< 0.7</td><td>-</td><td>µg/g</td></tr> <tr><td>30</td><td>Zn</td><td>Zinc</td><td>2.0</td><td>0.1</td><td>µg/g</td></tr> <tr><td>31</td><td>Ga</td><td>Gallium</td><td>1.7</td><td>0.1</td><td>µg/g</td></tr> <tr><td>32</td><td>Ge</td><td>Germanium</td><td>< 0.3</td><td>-</td><td>µg/g</td></tr> <tr><td>33</td><td>As</td><td>Arsenic</td><td>< 0.2</td><td>-</td><td>µg/g</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="6">B1</th> </tr> <tr> <th colspan="2">Results</th> <th>Information</th> <th>Measurement</th> <th>Spectrum</th> <th>Advanced</th> </tr> <tr> <th>No.</th> <th>Symbol</th> <th>Element</th> <th>Concentration</th> <th>Error</th> <th>Unit</th> </tr> </thead> <tbody> <tr><td>33</td><td>As</td><td>Arsenic</td><td>< 0.2</td><td>-</td><td>µg/g</td></tr> <tr><td>34</td><td>Se</td><td>Selenium</td><td>< 0.1</td><td>-</td><td>µg/g</td></tr> <tr><td>35</td><td>Br</td><td>Bromine</td><td>< 0.2</td><td>-</td><td>µg/g</td></tr> <tr><td>37</td><td>Rb</td><td>Rubidium</td><td>16.0</td><td>0.1</td><td>µg/g</td></tr> <tr><td>38</td><td>Sr</td><td>Strontium</td><td>0.41</td><td>0.05</td><td>µg/g</td></tr> <tr><td>39</td><td>Y</td><td>Yttrium</td><td>1.2</td><td>0.1</td><td>µg/g</td></tr> <tr><td>40</td><td>Zr</td><td>Zirconium</td><td>1.5</td><td>0.1</td><td>µg/g</td></tr> <tr><td>41</td><td>Nb</td><td>Niobium</td><td>2.2</td><td>0.1</td><td>µg/g</td></tr> <tr><td>42</td><td>Mo</td><td>Molybdenum</td><td>3.9</td><td>0.2</td><td>µg/g</td></tr> <tr><td>44</td><td>Ru</td><td>Ruthenium</td><td>0.18</td><td>0.04</td><td>µg/g</td></tr> <tr><td>45</td><td>Rh</td><td>Rhodium</td><td>0.0</td><td>0.0</td><td>µg/g</td></tr> <tr><td>46</td><td>Pd</td><td>Palladium</td><td>< 0.5</td><td>-</td><td>µg/g</td></tr> <tr><td>47</td><td>Ag</td><td>Silver</td><td>< 0.2</td><td>-</td><td>µg/g</td></tr> <tr><td>48</td><td>Cd</td><td>Cadmium</td><td>0.4</td><td>0.3</td><td>µg/g</td></tr> <tr><td>49</td><td>In</td><td>Indium</td><td>< 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0.0032	-	%	13	Al	Aluminium	1.341	0.003	%	14	Si	Silicon	< 0.00036	-	%	15	P	Phosphorus	< 0.3	-	µg/g	16	S	Sulfur	45540	10	µg/g	17	Cl	Chlorine	< 1.0	-	µg/g	19	K	Potassium	1.906	0.001	%	20	Ca	Calcium	0.00070	0.00021	%	21	Sc	Scandium	< 0.5	-	µg/g	22	Ti	Titanium	0.6	0.1	µg/g	23	V	Vanadium	< 0.2	-	µg/g	24	Cr	Chromium	0.4	0.1	µg/g	25	Mn	Manganese	< 0.2	-	µg/g	26	Fe	Iron	0.00259	0.00004	%	27	Co	Cobalt	0.4	0.2	µg/g	28	Ni	Nickel	< 0.8	-	µg/g	29	Cu	Copper	< 0.7	-	µg/g	30	Zn	Zinc	2.0	0.1	µg/g	31	Ga	Gallium	1.7	0.1	µg/g	32	Ge	Germanium	< 0.3	-	µg/g	33	As	Arsenic	< 0.2	-	µg/g	B1						Results		Information	Measurement	Spectrum	Advanced	No.	Symbol	Element	Concentration	Error	Unit	33	As	Arsenic	< 0.2	-	µg/g	34	Se	Selenium	< 0.1	-	µg/g	35	Br	Bromine	< 0.2	-	µg/g	37	Rb	Rubidium	16.0	0.1	µg/g	38	Sr	Strontium	0.41	0.05	µg/g	39	Y	Yttrium	1.2	0.1	µg/g	40	Zr	Zirconium	1.5	0.1	µg/g	41	Nb	Niobium	2.2	0.1	µg/g	42	Mo	Molybdenum	3.9	0.2	µg/g	44	Ru	Ruthenium	0.18	0.04	µg/g	45	Rh	Rhodium	0.0	0.0	µg/g	46	Pd	Palladium	< 0.5	-	µg/g	47	Ag	Silver	< 0.2	-	µg/g	48	Cd	Cadmium	0.4	0.3	µg/g	49	In	Indium	< 0.3	-	µg/g	50	Sn	Tin	2.1	0.7	µg/g	51	Sb	Antimony	1.6	0.7	µg/g	52	Te	Tellurium	8.1	1.3	µg/g	53	I	Iodine	10.3	1.3	µg/g	55	Cs	Cesium	39.3	3.5	µg/g	56	Ba	Barium	64.1	5.6	µg/g	57	La	Lanthanum	79.3	7.3	µg/g	B1						Results		Information	Measurement	Spectrum	Advanced	No.	Symbol	Element	Concentration	Error	Unit	49	In	Indium	< 0.3	-	µg/g	50	Sn	Tin	2.1	0.7	µg/g	51	Sb	Antimony	1.6	0.7	µg/g	52	Te	Tellurium	8.1	1.3	µg/g	53	I	Iodine	10.3	1.3	µg/g	55	Cs	Cesium	39.3	3.5	µg/g	56	Ba	Barium	64.1	5.6	µg/g	57	La	Lanthanum	79.3	7.3	µg/g	58	Ce	Cerium	128	11	µg/g	70	Yb	Ytterbium	< 0.2	-	µg/g	72	Hf	Hafnium	< 0.1	-	µg/g	73	Ta	Tantalum	< 0.8	-	µg/g	74	W	Tungsten	< 0.5	-	µg/g	78	Pt	Platinum	< 0.1	-	µg/g	79	Au	Gold	< 0.2	-	µg/g	80	Hg	Mercury	< 0.1	-	µg/g	81	Tl	Thallium	< 0.2	-	µg/g	82	Pb	Lead	< 0.3	-	µg/g	83	Bi	Bismuth	< 0.3	-	µg/g	90	Th	Thorium	< 0.1	-	µg/g	92	U	Uranium	< 0.2	-	µg/g
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15	P	Phosphorus	< 0.3	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
16	S	Sulfur	45540	10	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
17	Cl	Chlorine	< 1.0	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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35	Br	Bromine	< 0.2	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
37	Rb	Rubidium	16.0	0.1	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
38	Sr	Strontium	0.41	0.05	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
39	Y	Yttrium	1.2	0.1	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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41	Nb	Niobium	2.2	0.1	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
42	Mo	Molybdenum	3.9	0.2	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
44	Ru	Ruthenium	0.18	0.04	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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46	Pd	Palladium	< 0.5	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
47	Ag	Silver	< 0.2	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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56	Ba	Barium	64.1	5.6	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
57	La	Lanthanum	79.3	7.3	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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58	Ce	Cerium	128	11	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
70	Yb	Ytterbium	< 0.2	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
72	Hf	Hafnium	< 0.1	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
73	Ta	Tantalum	< 0.8	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
74	W	Tungsten	< 0.5	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
78	Pt	Platinum	< 0.1	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
79	Au	Gold	< 0.2	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
80	Hg	Mercury	< 0.1	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
81	Tl	Thallium	< 0.2	-	µg/g																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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B2 (Panci bekas + Kaleng minuman bekas dengan KOH 30%)	<div style="border: 1px solid black; padding: 5px;"> <p>B2 M TQ Pellets & Solids TA Pressed Tablet 600 seconds Tuesday, June 6, 2023</p> <p>Results Information Measurement Spectrum Advanced</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Symbol</th> <th>Element</th> <th>Concentration</th> <th>Error</th> <th>Unit</th> </tr> </thead> <tbody> <tr><td>11</td><td>Na</td><td>Sodium</td><td>< 0.00098</td><td>-</td><td>%</td></tr> <tr><td>12</td><td>Mg</td><td>Magnesium</td><td>< 0.00083</td><td>-</td><td>%</td></tr> <tr><td>13</td><td>Al</td><td>Aluminium</td><td>0.00135</td><td>0.00009</td><td>%</td></tr> <tr><td>14</td><td>Si</td><td>Silicon</td><td>< 0.00083</td><td>-</td><td>%</td></tr> <tr><td>15</td><td>P</td><td>Phosphorus</td><td>< 0.2</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>16</td><td>S</td><td>Sulfur</td><td>94.9</td><td>1.0</td><td>µg/g⁺</td></tr> <tr><td>17</td><td>Cl</td><td>Chlorine</td><td>< 1.1</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>19</td><td>K</td><td>Potassium</td><td>0.00125</td><td>0.00003</td><td>%</td></tr> <tr><td>20</td><td>Ca</td><td>Calcium</td><td>< 0.00088</td><td>-</td><td>%</td></tr> <tr><td>21</td><td>Sc</td><td>Scandium</td><td>< 0.5</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>22</td><td>Ti</td><td>Titanium</td><td>< 0.3</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>23</td><td>V</td><td>Vanadium</td><td>< 0.2</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>24</td><td>Cr</td><td>Chromium</td><td>< 0.1</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>25</td><td>Mn</td><td>Manganese</td><td>< 0.2</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>26</td><td>Fe</td><td>Iron</td><td>< 0.00015</td><td>-</td><td>%</td></tr> <tr><td>27</td><td>Co</td><td>Cobalt</td><td>1.1</td><td>0.2</td><td>µg/g⁺</td></tr> <tr><td>28</td><td>Ni</td><td>Nickel</td><td>4.3</td><td>0.4</td><td>µg/g⁺</td></tr> <tr><td>29</td><td>Cu</td><td>Copper</td><td>< 0.7</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>30</td><td>Zn</td><td>Zinc</td><td>< 0.5</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>31</td><td>Ga</td><td>Gallium</td><td>0.3</td><td>0.1</td><td>µg/g⁺</td></tr> <tr><td>32</td><td>Ge</td><td>Germanium</td><td>< 0.3</td><td>-</td><td>µg/g⁺</td></tr> <tr><td>33</td><td>As</td><td>Arsenic</td><td>< 0.2</td><td>-</td><td>µg/g⁺</td></tr> </tbody> </table> </div>	No.	Symbol	Element	Concentration	Error	Unit	11	Na	Sodium	< 0.00098	-	%	12	Mg	Magnesium	< 0.00083	-	%	13	Al	Aluminium	0.00135	0.00009	%	14	Si	Silicon	< 0.00083	-	%	15	P	Phosphorus	< 0.2	-	µg/g ⁺	16	S	Sulfur	94.9	1.0	µg/g ⁺	17	Cl	Chlorine	< 1.1	-	µg/g ⁺	19	K	Potassium	0.00125	0.00003	%	20	Ca	Calcium	< 0.00088	-	%	21	Sc	Scandium	< 0.5	-	µg/g ⁺	22	Ti	Titanium	< 0.3	-	µg/g ⁺	23	V	Vanadium	< 0.2	-	µg/g ⁺	24	Cr	Chromium	< 0.1	-	µg/g ⁺	25	Mn	Manganese	< 0.2	-	µg/g ⁺	26	Fe	Iron	< 0.00015	-	%	27	Co	Cobalt	1.1	0.2	µg/g ⁺	28	Ni	Nickel	4.3	0.4	µg/g ⁺	29	Cu	Copper	< 0.7	-	µg/g ⁺	30	Zn	Zinc	< 0.5	-	µg/g ⁺	31	Ga	Gallium	0.3	0.1	µg/g ⁺	32	Ge	Germanium	< 0.3	-	µg/g ⁺	33	As	Arsenic	< 0.2	-	µg/g ⁺
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Lampiran 4. Perhitungan dan Data %Removal Parameter Air Limbah

$$\%Removal = \frac{a - b}{a} \times 100\%$$

Parameter COD

SAMPEL	Keterangan	C (mg/L)	% Removal
Inlet	Awal	335,637	0
A2 (Panci bekas dengan KOH 30%)	1 gram	277,217	17,405709
	1,5 gram	319,053	4,9410524
	2 gram	252,342	24,81699
	2,5 gram	355,612	-5,95137
	3 gram	518,056	-54,35009
B1 (Panci bekas + Kaleng minuman bekas dengan KOH 20%)	1 gram	425,716	-26,83822
	1,5 gram	281,74	16,058122
	2 gram	714,798	-112,9676
	2,5 gram	1526,27	-354,7368
	3 gram	777,741	-131,7209
Komersial	1 gram	913,802	-172,259
	1,5 gram	738,166	-119,9299
	2 gram	828,999	-146,9927
	2,5 gram	533,132	-58,84184
	3 gram	479,613	-42,89634

Parameter TSS

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

$$\text{mg TSS per liter (Inlet)} = \frac{(540,6 - 517,6) \times 1000}{10} = 2300 \text{ mg/L}$$

$$\text{mg TSS per liter (A2; 1 gram)} = \frac{(580,9 - 554,7) \times 1000}{100} = 262 \text{ mg/L}$$

$$\text{mg TSS per liter (A2; 1,5 gram)} = \frac{(574,1 - 550,3) \times 1000}{100} = 238 \text{ mg/L}$$

$$\text{mg TSS per liter (A2; 2 gram)} = \frac{(569,4 - 546) \times 1000}{100} = 234 \text{ mg/L}$$

$$\text{mg TSS per liter (A2; 2,5 gram)} = \frac{(571,2 - 548,3) \times 1000}{100} = 229 \text{ mg/L}$$

$$\text{mg TSS per liter (A2; 3 gram)} = \frac{(569,6 - 547,9) \times 1000}{100} = 217 \text{ mg/L}$$

$$\text{mg TSS per liter (B1; 1 gram)} = \frac{(558,5 - 523,7) \times 1000}{100} = 348 \text{ mg/L}$$

$$\text{mg TSS per liter (B1; 1,5 gram)} = \frac{(570,8 - 543,6) \times 1000}{100} = 272 \text{ mg/L}$$

$$\text{mg TSS per liter (B1; 2 gram)} = \frac{(569,6 - 545,4) \times 1000}{100} = 242 \text{ mg/L}$$

$$\text{mg TSS per liter (B1; 2,5 gram)} = \frac{(574 - 556) \times 1000}{100} = 180 \text{ mg/L}$$

$$\text{mg TSS per liter (B1; 3 gram)} = \frac{(575 - 557,4) \times 1000}{100} = 176 \text{ mg/L}$$

$$\text{mg TSS per liter (K; 1 gram)} = \frac{(548,9 - 518,6) \times 1000}{100} = 303 \text{ mg/L}$$

$$\text{mg TSS per liter (K; 1,5 gram)} = \frac{(553,9 - 517,2) \times 1000}{100} = 376 \text{ mg/L}$$

$$\text{mg TSS per liter (K; 2 gram)} = \frac{(556,5 - 525,2) \times 1000}{100} = 313 \text{ mg/L}$$

$$\text{mg TSS per liter (K; 2,5 gram)} = \frac{(553,4 - 516) \times 1000}{100} = 374 \text{ mg/L}$$

$$\text{mg TSS per liter (K; 3 gram)} = \frac{(552,1 - 518,2) \times 1000}{100} = 339 \text{ mg/L}$$

SAMPEL	Keterangan	TSS (mg/L)	% Removal
Inlet	Awal	2300	0
A2 (Panci bekas dengan KOH 30%)	1 gram	262	88,61
	1,5 gram	238	89,65
	2 gram	234	89,83
	2,5 gram	229	90,04
	3 gram	217	90,57
B1 (Panci bekas + Kaleng minuman bekas dengan KOH 20%)	1 gram	348	84,87
	1,5 gram	272	88,17
	2 gram	242	89,48
	2,5 gram	180	92,17
	3 gram	176	92,35
Komersial	1 gram	303	86,83
	1,5 gram	367	84,04
	2 gram	313	86,39
	2,5 gram	374	83,74
	3 gram	339	85,26

Parameter Kekerusuhan

SAMPSEL	Keterangan	Kekeruhan (NTU)			%Removal (%)
		1	2	Rata-Rata	
Inlet	Awal	1017	1023	1020	0,00
A2 (Panci bekas dengan KOH 30%)	1 gram	90,3	90,9	90,6	91,12
	1,5 gram	119	120	119,5	88,28
	2 gram	89	89	89	91,27
	2,5 gram	47,9	48,9	48,4	95,25
	3 gram	36,9	37,5	37,2	96,35
B1 (Panci + Kaleng minuman bekas dengan KOH 20%)	1 gram	257	259	258	74,71
	1,5 gram	192	198	195	80,88
	2 gram	148	146	147	85,59
	2,5 gram	90,5	89,4	89,95	91,18
	3 gram	87,3	86,4	86,85	91,49
Komersial	1 gram	162	162	162	84,12
	1,5 gram	544	548	546	46,47
	2 gram	285	270	277,5	72,79
	2,5 gram	344	357	350,5	65,64
	3 gram	185	183	184	81,96

Lampiran 5. Bukti Submit Jurnal

The screenshot displays the OJS Submissions interface. On the left, there is a dark blue sidebar with the OJS logo and the text 'Submissions'. The main content area is titled 'Submissions' and features two tabs: 'My Queue' (with a notification badge '1') and 'Archives'. A 'Help' link is visible in the top right corner. Below the tabs, there is a 'My Assigned' section with a search bar and a 'New Submission' button. A single submission entry is listed with ID '13266', author 'Nanda Mustikarini et al.', and title 'Sintesis Koagulan Padat KAl(SO4)2 dari Panci Bekas dan Kaleng Minuman Bekas'. A 'Submission' button is located to the right of the entry. At the bottom of the page, it states 'Platform & workflow by OJS / PKP'. The browser's address bar shows 'talenta.usu.ac.id/jtk/submissions'. The Windows taskbar at the bottom indicates the system time as 14:41 on 31/07/2023, with a temperature of 30°C and weather 'Cerah'.

Lampiran 6. Draft Jurnal

Jurnal Teknik Kimia USU, Vol.00, No.00 (202x) 000-000



Sintesis Koagulan Padat $KAl(SO_4)_2$ dari Panci Bekas dan Kaleng Minuman Bekas

Synthesis of $KAl(SO_4)_2$ Solid Coagulants from Used Pots and Used Beverage Cans

Nanda Mustikarini¹, Ilma Fadlilah*¹, Theresia Evila Purwanti Sri Rahayu²

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

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ABSTRAK

Sintesis koagulan padat Kalium Aluminium Sulfat dapat dilakukan menggunakan bahan baku dengan kandungan aluminium yang tinggi salah satunya yaitu panci bekas dan kaleng minuman bekas. Proses sintesis meliputi tahapan preparasi, pelarutan, ekstraksi, kristalisasi, dan pengeringan. Penelitian ini menggunakan variasi bahan baku berupa panci aluminium dan paduan antara panci + kaleng minuman dengan masing-masing variasi pelarut KOH 20%, 30%, dan 40%. Hasil sintesis yang telah dikarakterisasi menggunakan XRF (X-Ray Fluorescence) menghasilkan kandungan Al sebesar 0,001-3%. Hasil analisis data yang disesuaikan dengan SNI 06-2102-1991 tentang Kalium Aluminium Sulfat menunjukkan bahwa hasil sintesis telah memenuhi parameter bagian yang tidak larut dalam air, Fe, Pb, dan As yang dipersyaratkan serta Al_2SO_3 yang mendekati persyaratan mutu.

Kata kunci: ekstraksi, kaleng minuman, Kalium Aluminium Sulfat, koagulan, panci aluminium

ABSTRACT

Synthesis of solid coagulant Potassium Aluminum Sulfate can be carried out using raw materials with a high aluminum content, one of which is used pots and used beverage cans. The synthesis process includes the stages of preparation, dissolution, extraction, crystallization and drying. This study used a variety of raw materials in the form of aluminum pans and a mixture of pots + beverage cans with each variation of 20%, 30%, and 40% KOH solvent. The results of the synthesis which have been characterized using XRF (X-Ray Fluorescence) produce an Al content of 0.001-3%. The results of data analysis adapted to SNI 06-2102-1991 concerning Potassium Aluminum Sulphate showed that the synthesis results met the required parameters of the water insoluble part, Fe, Pb and As and Al_2SO_3 which was close to the quality requirements.

Keyword: extraction, beverage cans, Potassium Aluminum Sulfate, coagulant, aluminum pots

Lampiran 7. Biodata Penulis



Nanda Mustikarini merupakan nama penulis pada penelitian Tugas Akhir dengan judul Sintesis Bahan Koagulan $KAl(SO_4)_2$ dari Panci Bekas dan Kaleng Minuman Bekas untuk Pengolahan Limbah Cair Industri Tempe. Penulis merupakan anak ke-3 dari 4 bersaudara dari pasangan Bapak Watam Solihin dan Ibu Saliyah. Penulis lahir di Cilacap, 10 September 2001. Beralamat di Jalan Belimbing No. 71 RT 003/RW 004, Desa Karangkemiri, Kecamatan Maos, Kabupaten Cilacap. Penulis dapat dihubungi melalui alamat email: nandamustikarini1009@gmail.com. Penulis menempuh pendidikan formal diawali di TK Siwi Peni Karangkemiri (2006-2007), SD Negeri Karangkemiri 01 (2007-2013), dilanjutkan di SMP Negeri 2 Maos (2013-2016), SMA Negeri 1 Maos (2016-2019), dan Politeknik Negeri Cilacap (2019-2023) prodi Sarjana Terapan Teknik Pengendalian Pencemaran Lingkungan. Selama masa perkuliahan, penulis aktif dalam organisasi kampus yaitu Himpunan Mahasiswa Teknik Pengendalian Pencemaran Lingkungan pada periode 2020/2021 sebagai Sekretaris II, dan periode 2021/2022 sebagai Sekretaris II. Selain itu, penulis juga aktif dalam organisasi luar kampus sebagai anggota pada organisasi Sobat Bumi Indonesia Regional Semarang dan kegiatan volunteer Bank Sampah Enviro'18. Penelitian dan penulisan laporan Tugas Akhir ini ditujukan sebagai persyaratan untuk mendapatkan gelar Sarjana Terapan (S.Tr.) sekaligus sebagai penerapan ilmu yang telah didapatkan sehingga dapat meningkatkan wawasan dan kemampuan penulis khususnya pada bidang pengendalian pencemaran lingkungan.