

## LAMPIRAN II PERHITUNGAN

### 1. Pembuatan Larutan

- a. Larutan Iodin 0,1 N dalam 1000 ml

$$N = \frac{\text{gr}}{\text{BM}} \times \frac{1000}{V} \times \text{valensi}$$

$$0,1 = \frac{\text{gr}}{254} \times \frac{1000}{1000} \times 2$$

$$\text{gr} = 12,7 \text{ gr}$$

- b. Larutan Kanji 1 %

$$\% = \frac{\text{gr}}{V} \times 100\%$$

$$1\% = \frac{\text{gr}}{100 \text{ ml}} \times 100\%$$

$$\text{gr} = 1 \text{ gram}$$

- c. Larutan  $\text{Na}_2\text{S}_2\text{O}_3$  0,1 N dalam 1000 ml

$$N = \frac{\text{gr}}{\text{BM}} \times \frac{1000}{V} \times \text{valensi}$$

$$0,1 = \frac{\text{gr}}{248} \times \frac{1000}{1000} \times 2$$

$$\text{gr} = 12,4 \text{ gr}$$

### 2. Perhitungan Kadar Air

- a. KOH 5 %

$$\% \text{ Kadar Air} = \left[ \frac{W_2 - W_3}{W_2 - W_1} \right] \times 100\%$$

$$= \frac{28,5829 \text{ gr} - 28,5450 \text{ gr}}{28,5829 \text{ gr} - 25,5784 \text{ gr}} \times 100 \%$$

$$= \frac{0,0379 \text{ gr}}{3,0045 \text{ gr}} \times 100 \%$$

$$= 1,261 \%$$

b. KOH 10 %

$$\begin{aligned}
 \% \text{ Kadar Air} &= \left[ \frac{W_2 - W_3}{W_2 - W_1} \right] \times 100\% \\
 &= \frac{33,3070 \text{ gr} - 33,2694 \text{ gr}}{33,3070 \text{ gr} - 30,3054 \text{ gr}} \times 100 \% \\
 &= \frac{0,0376 \text{ gr}}{3,0016 \text{ gr}} \times 100 \% \\
 &= 1,253 \%
 \end{aligned}$$

c. KOH 15 %

$$\begin{aligned}
 \% \text{ Kadar Air} &= \left[ \frac{W_2 - W_3}{W_2 - W_1} \right] \times 100\% \\
 &= \frac{33,3584 \text{ gr} - 33,3210 \text{ gr}}{33,3584 \text{ gr} - 30,3561 \text{ gr}} \times 100 \% \\
 &= \frac{0,0374 \text{ gr}}{3,0023 \text{ gr}} \times 100 \% \\
 &= 1,246 \%
 \end{aligned}$$

d. KOH 20 %

$$\begin{aligned}
 \% \text{ Kadar Air} &= \left[ \frac{W_2 - W_3}{W_2 - W_1} \right] \times 100\% \\
 &= \frac{33,3239 \text{ gr} - 33,2870 \text{ gr}}{33,3239 \text{ gr} - 30,3192 \text{ gr}} \times 100 \% \\
 &= \frac{0,0366 \text{ gr}}{3,0047 \text{ gr}} \times 100 \% \\
 &= 1,228 \%
 \end{aligned}$$

e. KOH 25 %

$$\begin{aligned}
 \% \text{ Kadar Air} &= \left[ \frac{W_2 - W_3}{W_2 - W_1} \right] \times 100\% \\
 &= \frac{33,3196 \text{ gr} - 33,2825 \text{ gr}}{33,3196 \text{ gr} - 30,3140 \text{ gr}} \times 100 \% \\
 &= \frac{0,0371 \text{ gr}}{3,0056 \text{ gr}} \times 100 \% \\
 &= 1,234 \%
 \end{aligned}$$

### 3. Perhitungan Kadar Abu

a. KOH 5 %

$$\begin{aligned}
 \% \text{ Kadar Abu} &= \left[ \frac{W_2 - W_3}{W_1} \right] \times 100\% \\
 &= \frac{58,9861 \text{ gr} - 57,480 \text{ gr}}{55,9861} \times 100 \% \\
 &= \frac{1,506 \text{ gr}}{55,9861 \text{ gr}} \times 100 \% \\
 &= 2,690 \%
 \end{aligned}$$

b. KOH 10 %

$$\begin{aligned}
 \% \text{ Kadar Abu} &= \left[ \frac{W_2 - W_3}{W_1} \right] \times 100\% \\
 &= \frac{28,5921 \text{ gr} - 27,895 \text{ gr}}{25,5921} \times 100 \% \\
 &= \frac{0,697 \text{ gr}}{25,5921 \text{ gr}} \times 100 \% \\
 &= 2,724 \%
 \end{aligned}$$

c. KOH 15 %

$$\begin{aligned}
 \% \text{ Kadar Abu} &= \left[ \frac{W_2 - W_3}{W_1} \right] \times 100\% \\
 &= \frac{33,3188 \text{ gr} - 32,577 \text{ gr}}{30,3188} \times 100 \% \\
 &= \frac{0,742 \text{ gr}}{30,3188 \text{ gr}} \times 100 \% \\
 &= 2,457 \%
 \end{aligned}$$

d. KOH 20 %

$$\begin{aligned}
 \% \text{ Kadar Abu} &= \left[ \frac{W_2 - W_3}{W_1} \right] \times 100\% \\
 &= \frac{73,9419 \text{ gr} - 72,264 \text{ gr}}{70,9419} \times 100 \% \\
 &= \frac{1,678 \text{ gr}}{70,9419 \text{ gr}} \times 100 \% \\
 &= 2,375 \%
 \end{aligned}$$

e. KOH 25 %

$$\begin{aligned}
 \% \text{ Kadar Abu} &= \left[ \frac{W_2 - W_3}{W_1} \right] \times 100\% \\
 &= \frac{59,475 \text{ gr} - 58,039 \text{ gr}}{56,475} \times 100 \% \\
 &= \frac{1,436 \text{ gr}}{56,475 \text{ gr}} \times 100 \% \\
 &= 2,543 \%
 \end{aligned}$$

#### 4. Perhitungan Bilangan Iod

Berat Karbon Aktif = 0,5 gr  
 Vol. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> (blanko) = 26,2 ml  
 Normalitas Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> = 0,1 N  
 Be I<sub>2</sub> = 126,91

a. KOH 5 %

Vol. Bahan = 14,5 ml

$$\begin{aligned}
 \text{Bil Iod} &= \frac{25}{10} \times \frac{(\text{Vol titrasi blanko} - \text{Vol titrasi bahan}) \times \text{Be Iod} \times N}{\text{Berat Karbon Aktif (W)}} \\
 &= \frac{25}{10} \times \frac{(26,2 - 14,5) \text{ ml} \times 126,91 \text{ mg/ml} \times 0,1}{0,5 \text{ gr}} \\
 &= 742,423 \text{ mg/gr}
 \end{aligned}$$

b. KOH 10 %

Vol. Bahan = 14,0 ml

$$\begin{aligned}
 \text{Bil Iod} &= \frac{25}{10} \times \frac{(\text{Vol titrasi blanko} - \text{Vol titrasi bahan}) \times \text{Be Iod} \times N}{\text{Berat Karbon Aktif (W)}} \\
 &= \frac{25}{10} \times \frac{(26,2 - 14,0) \text{ ml} \times 126,91 \text{ mg/ml} \times 0,1}{0,5 \text{ gr}} \\
 &= 774,151 \text{ mg/gr}
 \end{aligned}$$

c. KOH 15 %

$$\text{Vol. Bahan} = 12,6 \text{ ml}$$

$$\begin{aligned} \text{Bil Iod} &= \frac{25}{10} \times \frac{(\text{Vol titrasi blanko} - \text{Vol titrasi bahan}) \times \text{Be Iod} \times N}{\text{Berat Karbon Aktif (W)}} \\ &= \frac{25}{10} \times \frac{(26,2 - 12,6) \text{ ml} \times 126,91 \text{ mg/ml} \times 0,1}{0,5 \text{ gr}} \\ &= 862,988 \text{ mg/gr} \end{aligned}$$

d. KOH 20 %

$$\text{Vol. Bahan} = 12,4 \text{ ml}$$

$$\begin{aligned} \text{Bil Iod} &= \frac{25}{10} \times \frac{(\text{Vol titrasi blanko} - \text{Vol titrasi bahan}) \times \text{Be Iod} \times N}{\text{Berat Karbon Aktif (W)}} \\ &= \frac{25}{10} \times \frac{(26,2 - 12,4) \text{ ml} \times 126,91 \text{ mg/ml} \times 0,1}{0,5 \text{ gr}} \\ &= 875,679 \text{ mg/gr} \end{aligned}$$

e. KOH 25 %

$$\text{Vol. Bahan} = 13 \text{ ml}$$

$$\begin{aligned} \text{Bil Iod} &= \frac{25}{10} \times \frac{(\text{Vol titrasi blanko} - \text{Vol titrasi bahan}) \times \text{Be Iod} \times N}{\text{Berat Karbon Aktif (W)}} \\ &= \frac{25}{10} \times \frac{(26,2 - 13) \text{ ml} \times 126,91 \text{ mg/ml} \times 0,1}{0,5 \text{ gr}} \\ &= 837,606 \text{ mg/gr} \end{aligned}$$

## 5. Perhitungan Konsentrasi Limbah Zat Warna yang Terserap

Dari kurva standarisasi analisa kolorimetrik didapatkan persamaan :

$$y = 0,0037 x + 0,0173$$

Dimana : y = absorbansi sampel

### 5.1 Limbah Zat Warna Awal ( y = 0,064 )

$$y = 0,0037 x + 0,0173$$

$$0,064 = 0,0037 x + 0,0173$$

$$0,0037 x = 0,064 - 0,0173$$

$$x = 15,67 \text{ ppm}$$

## 5.2 Waktu kontak 15 menit

### a. Aktivator KOH 5 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.056 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.056 - 0.0173 \\ x &= 13.00 \text{ ppm} \end{aligned}$$

### b. Aktivator KOH 10 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.054 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.054 - 0.0173 \\ x &= 12,33 \text{ ppm} \end{aligned}$$

### c. Aktivator KOH 15 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.049 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.049 - 0.0173 \\ x &= 10.67 \text{ ppm} \end{aligned}$$

### d. Aktivator KOH 20 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.044 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.044 - 0.0173 \\ x &= 9.00 \text{ ppm} \end{aligned}$$

### e. Aktivator KOH 5 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.045 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.045 - 0.0173 \\ x &= 9.33 \text{ ppm} \end{aligned}$$

### 5.3 Waktu kontak 30 menit

a. Aktivator KOH 5 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.044 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.044 - 0.0173 \\ x &= 9.00 \text{ ppm} \end{aligned}$$

b. Aktivator KOH 10 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.043 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.043 - 0.0173 \\ x &= 8.67 \text{ ppm} \end{aligned}$$

c. Aktivator KOH 15 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.042 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.042 - 0.0173 \\ x &= 8.33 \text{ ppm} \end{aligned}$$

d. Aktivator KOH 20 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.039 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.039 - 0.0173 \\ x &= 7.33 \text{ ppm} \end{aligned}$$

e. Aktivator KOH 25 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.040 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.040 - 0.0173 \\ x &= 7.67 \text{ ppm} \end{aligned}$$

#### 5.4 Waktu kontak 45 menit

a. Aktivator KOH 5 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.046 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.046 - 0.0173 \\ x &= 9.67 \text{ ppm} \end{aligned}$$

b. Aktivator KOH 10 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.045 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.043 - 0.0173 \\ x &= 9.33 \text{ ppm} \end{aligned}$$

c. Aktivator KOH 15 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.039 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.039 - 0.0173 \\ x &= 7.33 \text{ ppm} \end{aligned}$$

d. Aktivator KOH 20 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.035 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.035 - 0.0173 \\ x &= 6.00 \text{ ppm} \end{aligned}$$

e. Aktivator KOH 25 %

$$\begin{aligned} y &= 0.0037 x + 0.0173 \\ 0.036 &= 0.0037 x + 0.0173 \\ 0.0037 x &= 0.036 - 0.0173 \\ x &= 6.33 \text{ ppm} \end{aligned}$$



## 6. Perhitungan Persentase Daya Adsorpsi

$$\% \text{ Adsorpsi} = \frac{\text{Konsentrasi Limbah Awal} - \text{Konsentrasi Limbah akhir}}{\text{Konsentrasi Limbah Awal}} \times 100$$

### 6.1 Waktu kontak 15 menit

a. Aktivator KOH 5 %

$$\begin{aligned} \% \text{ Adsorpsi} &= \frac{15,67 - 13,00}{15,67} \times 100 \% \\ &= 17,039 \% \end{aligned}$$

b. Aktivator KOH 10 %

$$\begin{aligned} \% \text{ Adsorpsi} &= \frac{15,67 - 12,33}{15,67} \times 100 \% \\ &= 21,315 \% \end{aligned}$$

c. Aktivator KOH 15 %

$$\begin{aligned} \% \text{ Adsorpsi} &= \frac{15,67 - 10,67}{15,67} \times 100 \% \\ &= 31,908 \% \end{aligned}$$

d. Aktivator KOH 20 %

$$\begin{aligned} \% \text{ Adsorpsi} &= \frac{15,67 - 9,00}{15,67} \times 100 \% \\ &= 42,565 \% \end{aligned}$$

e. Aktivator KOH 25 %

$$\begin{aligned} \% \text{ Adsorpsi} &= \frac{15,67 - 9,33}{15,67} \times 100 \% \\ &= 40,459 \% \end{aligned}$$

### 6.2 Waktu kontak 30 menit

a. Aktivator KOH 5 %

$$\begin{aligned} \% \text{ Adsorpsi} &= \frac{15,67 - 9,00}{15,67} \times 100 \% \\ &= 42,565 \% \end{aligned}$$

b. Aktivator KOH 10 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-8,67}{15,67} \times 100 \% \\ &= 44,671 \%\end{aligned}$$

c. Aktivator KOH 15 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-8,33}{15,67} \times 100 \% \\ &= 46,841 \%\end{aligned}$$

d. Aktivator KOH 20 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-7,33}{15,67} \times 100 \% \\ &= 53,223 \%\end{aligned}$$

e. Aktivator KOH 25 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-7,67}{15,67} \times 100 \% \\ &= 51,053 \%\end{aligned}$$

### 6.3 Waktu kontak 45 menit

a. Aktivator KOH 5 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-9,67}{15,67} \times 100 \% \\ &= 38,290 \%\end{aligned}$$

b. Aktivator KOH 10 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-9,33}{15,67} \times 100 \% \\ &= 40,459 \%\end{aligned}$$

c. Aktivator KOH 15 %

$$\begin{aligned}\% \text{ Adsorbsi} &= \frac{15,67-7,33}{15,67} \times 100 \% \\ &= 53,223 \%\end{aligned}$$

d. Aktivator KOH 20 %

$$\begin{aligned}\% \text{ Adsorpsi} &= \frac{15,67-6,00}{15,67} \times 100 \% \\ &= 61,710 \%\end{aligned}$$

e. Aktivator KOH 25 %

$$\begin{aligned}\% \text{ Adsorpsi} &= \frac{15,67-6,33}{15,67} \times 100 \% \\ &= 59,604 \%\end{aligned}$$