LAMPIRAN

Lampiran 1. Pembuatan Larutan Stok Cd(II) 100 ppm

Diketahui : Konsentrasi larutan induk = 100 ppm = $\frac{100\ mg}{L}$

Volume akhir = 100 mL

MrCdSO$_4$.H$_2$O = 226,482 gram/mol

Ar Cd(II) = 112,411

Ditanya : Massa CdSO$_4$.H$_2$O

Jawab :

$$mol\ \mathrm{Cd(II)}\ dalam\ 1\ Liter = \frac{masssa\ \ Cd(II)}{Ar\ Cd(II)}$$

$$mol\ \mathrm{Cd(II)}\ dalam\ 1\ Liter = \frac{100\ mg}{112{,}411}$$

$$mol\ \mathrm{Cd(II)}\ dalam\ 1\ Liter = \ 0{,}889\ mmol$$

$$mol\ \mathrm{CdSO_4.8H_2O} = \mathrm{mol\ Cd(II)}$$

$$= \frac{1}{1}\ \mathrm{x\ 0{,}889\ mmol}$$

$$= 0{,}889\ \mathrm{mmol}$$

$$\mathrm{massa\ CdSO_4.H_2O} = 0{,}889\ \mathrm{mmol\ x\ 226{,}482\ mg\ /mmol}$$

$$= 201{,}3425\ mg\ @1000\ mL$$

$$= 20{,}1343\ mg\ @100\ mL$$

Lampiran 2. Pembuatan Larutan Cd(II) 5 ppm

Diketahui : Konsentrasi larutan stok Cd(II) (M1) =100 ppm

Konsentrasi larutan yang dibuat (M2) = 5 ppm

Volume akhir (V2) = 500 mL

Ditanya :Volume larutan stok Cd (II) 100 ppm yang dipipet (V1) ?

Jawab :

$$M1 \times V1 = M2 \times V2$$

$$100\ ppm\ \times V1 = 5\ ppm \times 500\ mL$$

$$V1 = 25\ mL$$

Lampiran 3. Pembuatan Kurva Baku

Diketahui : Konsentrasi larutan standar $3CdSO_4.8H_2O$ (M1) =100 ppm
Konsentrasi larutan yang dibuat (M2) = 1,2,3,4 dan 5 ppm
Volume akhir (V2) = 20 mL

Ditanya :Volume larutan induk $3CdSO_4.8H_2O$ 100 ppm yang dipipet (V1) ?

Jawab :

$$M1 \times V1 = M2 \times V2$$

$$100\ \text{ppm}\ \times \text{V1} = 1\ \text{ppm} \times 100\ \text{mL}$$

$$100\ \text{ppm}\ \times \text{V1} = 2\ \text{ppm} \times 100\ \text{mL}$$

$$100\ \text{ppm}\ \times \text{V1} = 3\ \text{ppm} \times 100\ \text{mL}$$

$$100\ \text{ppm}\ \times \text{V1} = 4\ \text{ppm} \times 100\ \text{mL}$$

$$\text{V1} = 4\ \text{mL}$$

$$100\ \text{ppm}\ \times \text{V1} = 5\ \text{ppm} \times 100\ \text{mL}$$

$$\text{V1} = 5\ \text{mL}$$

Lampiran 4. Pembuatan H_2SO_4 0,5N

Diketahui : Konsentrasi H_2SO_4 pekat = 98%
BJ = 1,84g/mL
Mr = 98,08g/mol
a (jumlah ion $[H^+]$) = 2

Ditanya : Volume yang dipipet untuk Pembuatan H_2SO_4 0,5N ?

Jawab :

- Pengubahan Normalitas (N) menjadi Molaritas (M)

  $N = M.a$

  $0{,}5\ N = M.2$

  $M = \frac{0{,}5}{2}$

  $M = 0{,}25M$

- $M = \frac{10 \text{ x } \% \text{ x BJ}}{\text{Mr}}$

$$M = \frac{10\ x\ 98\%\ x\ 1{,}84\ g/ml}{98{,}08 g/mol}$$

$$M = 18{,}38M$$

- $M1 \times V1 = M2\ \times V2$

$18{,}38\ M \times V1 = 0{,}25M\ \times 100$ mL

V1 = 1,36 mL

Lampiran 5. Perhitungan Konsentrasi Awal (C) dan Konsentrasi Akhir (Co) Larutan Sampel

Persamaan regresi linear : y = 0,0986x + 0,4772

- Konsentrasi awal (C)

  Absorbansi = 1,573

  y = 0,0986x + 0,4772

  1,573 = 0,0986x + 0,4772

  x $= \frac{1{,}573 - 0{,}4772}{0{,}0986}$

  x = 11,164 ppm

- Konsentrasi Akhir (Co)
- Variasi Massa 0,05 gram

  # Rep 1 : Absorbansi = 1,554

y = 0,0986x + 0,4772

1,554 = 0,0986x + 0,4772

x $= \frac{1,554-0,4772}{0,0986}$

x = 10,972 ppm

Rep 2 : Absorbansi = 1,553

y = 0,0986x + 0,4772

1,553 = 0,0986x + 0,4772

x $= \frac{1,553-0,4772}{0,0986}$

x = 10,961 ppm

- Variasi Massa 0,1 gram

Rep 1 : Absorbansi = 1,520

y = 0,0986x + 0,4772

1,520 = 0,0986x + 0,4772

x $= \frac{1,520-0,4772}{0,0986}$

x = 10,627 ppm

Rep 2 : Absorbansi = 1,336

y = 0,0986x + 0,4772

1,336 = 0,0986x + 0,4772

x $= \frac{1,336-0,4772}{0,0986}$

x = 9,065 ppm

- Variasi Massa 0,15 gram

Rep 1 : Absorbansi = 1,360

y = 0,0986x + 0,4772

1,360 = 0,0986x + 0,4772

x $= \frac{1,360-0,4772}{0,0986}$

x = 9,004 ppm

Rep 2 : Absorbansi = 1,368

y = 0,0986x + 0,4772

1,368 = 0,0986x + 0,4772

x $= \frac{1,368-0,4772}{0,0986}$

x = 9,085 ppm

- Variasi Massa 0,2 gram

  # Rep 1 : Absorbansi = 1,175

  y = 0,0986x + 0,4772

  1,175 = 0,0986x + 0,4772

  x $= \frac{1,175-0,4772}{0,0986}$

  x = 7,128 ppm

  # Rep 2 : Absorbansi = 1,172

  y = 0,0986x + 0,4772

  1,172 = 0,0986x + 0,4772

  x $= \frac{1,172-0,4772}{0,0986}$

  x = 7,092 ppm

- Variasi Massa 0,25 gram

  # Rep 1 : Absorbansi = 1,425

  y = 0,0986x + 0,4772

  1,425 = 0,0986x + 0,4772

  x $= \frac{1,425-0,4772}{0,0986}$

  x = 9,663 ppm

  # Rep 2 : Absorbansi = 1,460

  y = 0,0986x + 0,4772

  1,460 = 0,0986x + 0,4772

  x $= \frac{1,460-0,4772}{0,0986}$

  x = 10,018 ppm

- Variasi Massa 0,3 gram

  # Rep 1 : Absorbansi = 1,430

y = 0,0986x + 0,4772

1,430 = 0,0986x + 0,4772

x $= \frac{1,430-0,4772}{0,0986}$

x = 9,714 ppm

Rep 2 : Absorbansi = 1,453

y = 0,0986x + 0,4772

1,453 = 0,0986x + 0,4772

x $= \frac{1,453-0,4772}{0,0986}$

x = 9,947 ppm

- Variasi Massa 0,4 gram

Rep 1 : Absorbansi = 1,464

y = 0,0986x + 0,4772

1,464 = 0,0986x + 0,4772

x $= \frac{1,464-0,4772}{0,0986}$

x = 10,059 ppm

Rep 2 : Absorbansi = 1,507

y = 0,0986x + 0,4772

1,507 = 0,0986x + 0,4772

x $= \frac{1,507-0,4772}{0,0986}$

x = 10,495 ppm

- Variasi Massa 0,5 gram

Rep 1 : Absorbansi = 1,533

y = 0,0986x + 0,4772

1,533 = 0,0986x + 0,4772

x $= \frac{1,533-0,4772}{0,0986}$

x = 10,759 ppm

Rep 2 : Absorbansi = 1,537

y = 0,0986x + 0,4772

1,537 = 0,0986x + 0,4772

x $= \frac{1,537-0,4772}{0,0986}$

x = 10,799 ppm

Lampiran 6. Data Penimbangan Variasi Massa Adsorben

Variasi Massa	Replikasi	Massa Penimbangan (gram)
0,05	1	0,0500
	2	0,0502
0,10	1	0,1001
	2	0,1003
0,15	1	0,1500
	2	0,1504
0,20	1	0,2003
	2	0,2004
0,25	1	0,2503
	2	0,2507
0,30	1	0,3003
	2	0,3005
0,40	1	0,4000
	2	0,4001
0,50	1	0,5002
	2	0,5003

Lampiran 7. Perhitungan Kapasitas Adsorpsi Ion Cd(II)

Diketahui :

Konsentrasi awal (Co): 11,164 ppm

Volume : 0,02L

$q = \frac{Co-C\ x\ V}{m}$ Persamaan (1)

- Variasi Massa 0,05 gram

  # Rep 1 : Konsentrasi (C) = 10,972 ppm

Massa (m) = 0,0500 gram

$$q = \frac{11{,}164\ ppm - 10{,}972\ ppm\ x\ 0{,}02\ L}{0{,}0500\ gram}$$

q = 0,077 mg/g

Rep 2 : Konsentrasi (C) = 10,961 ppm

Massa (m) = 0,0502 gram

$$q = \frac{11{,}164\ ppm - 10{,}961\ ppm\ x\ 0{,}02\ L}{0{,}0500\ gram}$$

q = 0,077 mg/g

- Rata-Rata : $\frac{0{,}077 + 0{,}081\ mg/g}{2}$

: 0,079 mg/g

- Variasi Massa 0,1 gram

Rep 1 : Konsentrasi (C) = 10,627 ppm

Massa (m) = 0,0500 gram

$$q = \frac{11{,}164\ ppm - 10{,}627\ ppm\ x\ 0{,}02\ L}{0{,}1001\ gram}$$

q = 0,107 mg/g

Rep 2 : Konsentrasi (C) = 9,065 ppm

Massa (m) = 0,1003 gram

$$q = \frac{11{,}164\ ppm - 9{,}065\ ppm\ x\ 0{,}02\ L}{0{,}1003\ gram}$$

q = 0,419 mg/g

- Rata-Rata : $\frac{0{,}107 + 0{,}419\ mg/g}{2}$

: 0,263 mg/g

- Variasi Massa 0,15 gram

Rep 1 : Konsentrasi (C) = 9,004 ppm

Massa (m) = 0,1500 gram

$$q = \frac{11{,}164\ ppm - 9{,}004\ ppm\ x\ 0{,}02\ L}{0{,}1500\ gram}$$

q = 0,288 mg/g

Rep 2 : Konsentrasi (C) = 9,085 ppm

Massa (m) = 0,1504 gram

$$q = \frac{11{,}164\ ppm - 9{,}085\ ppm\ x\ 0{,}02\ L}{0{,}1504\ gram}$$

q = 0,276 mg/g

- Rata-Rata : $\frac{0{,}288+0{,}276\ mg/g}{2}$

: 0,282 mg/g

- Variasi Massa 0,2 gram

Rep 1 : Konsentrasi (C) = 7,128 ppm

Massa (m) = 0,2003 gram

$$q = \frac{11{,}164\ ppm - 7{,}128\ ppm\ x\ 0{,}02\ L}{0{,}2003\ gram}$$

q = 0,403 mg/g

Rep 2 : Konsentrasi (C) = 7,097 ppm

Massa (m) = 0,2004 gram

$$q = \frac{11{,}164\ ppm - 7{,}097\ ppm\ x\ 0{,}02\ L}{0{,}2004\ gram}$$

q = 0,406 mg/g

- Rata-Rata : $\frac{0{,}403+0{,}406\ mg/g}{2}$

: 0,404 mg/g

- Variasi Massa 0,25 gram

Rep 1 : Konsentrasi (C) = 9,663 ppm

Massa (m) = 0,2503 gram

$$q = \frac{11{,}164\ ppm - 9{,}663\ ppm\ x\ 0{,}02\ L}{0{,}2503\ gram}$$

q = 0,120 mg/g

Rep 2 : Konsentrasi (C) = 10,018 ppm

Massa (m) = 0,2507 gram

$$q = \frac{11{,}164\ ppm - 10{,}018\ ppm\ x\ 0{,}02\ L}{0{,}2507\ gram}$$

q = 0,091 mg/g

- Rata-Rata : $\frac{0{,}120+0{,}091\ mg/g}{2}$

: 0,106 mg/g

- Variasi Massa 0,3 gram

  # Rep 1 : Konsentrasi (C) = 9,714 ppm

  Massa (m) = 0,3003 gram

  $$q = \frac{11{,}164\ ppm - 9{,}714\ ppm\ x\ 0{,}02\ L}{0{,}3003\ gram}$$

  q = 0,097 mg/g

  # Rep 2 : Konsentrasi (C) = 9,947 ppm

  Massa (m) = 0,3005 gram

  $$q = \frac{11{,}164\ ppm - 9{,}947\ ppm\ x\ 0{,}02\ L}{0{,}3005\ gram}$$

  q = 0,081 mg/g

  - Rata-Rata : $\frac{0{,}097+0{,}081\ mg/g}{2}$

  : 0,089 mg/g

- Variasi Massa 0,4 gram

  # Rep 1 : Konsentrasi (C) = 10,059 ppm

  Massa (m) = 0,4000 gram

  $$q = \frac{11{,}164\ ppm - 10{,}059\ ppm\ x\ 0{,}02\ L}{0{,}4000\ gram}$$

  q = 0,055 mg/g

  # Rep 2 : Konsentrasi (C) = 10,495 ppm

  Massa (m) = 0,4001 gram

  $$q = \frac{11{,}164\ ppm - 10{,}495\ \ ppm\ x\ 0{,}02\ L}{0{,}4001\ gram}$$

  q = 0,033 mg/g

  - Rata-Rata : $\frac{0{,}055+0{,}033\ mg/g}{2}$

  : 0,044 mg/g

- Variasi Massa 0,5 gram

  # Rep 1 : Konsentrasi (C) = 10,759 ppm

  Massa (m) = 0,5002gram

  $$q = \frac{11{,}164\ ppm - 10{,}759\ ppm\ x\ 0{,}02\ L}{0{,}5002\ gram}$$

  q = 0,016 mg/g

Rep 2 : Konsentrasi (C) = 10,799 ppm

Massa (m) = 0,5003 gram

$$q = \frac{11{,}164\ ppm - 10{,}799\ ppm\ x\ 0{,}02\ L}{0{,}5003\ gram}$$

$$q = 0{,}015 \text{ mg/g}$$

- Rata-Rata : $\frac{0{,}016+0{,}015\ mg/g}{2}$

: 0,015 mg/g

Lampiran 8. Perhitungan % Adsorpsi (R)

$$R = \frac{Co - C}{Co} x\ 100\% \quad Persamaan\ (2)$$

- Variasi Massa 0,05 gram

Rep 1 :

$$R = \frac{11{,}164\ ppm - 10{,}972\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

R = 1,726%

Rep 2 :

$$R = \frac{11{,}164\ ppm - 10{,}961\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

R = 1,817%

- Rata-Rata : $\frac{1{,}726+1{,}817\%}{2}$

: 1,771%

- Variasi Massa 0,1 gram

Rep 1 :

$$R = \frac{11{,}164\ ppm - 10{,}627\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

R = 4,815%

Rep 2 :

$$R = \frac{11{,}164\ ppm - 9{,}065\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

R = 18,805%

- Rata-Rata : $\frac{4{,}815+18{,}805\%}{2}$

: 11,810%

- Variasi Massa 0,15 gram

  # Rep 1 :

  $$R = \frac{11{,}164\ ppm - 9{,}004\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

  R = 19,350%

  # Rep 2 :

  $$R = \frac{11{,}164\ ppm - 9{,}085\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

  R = 18,623%

  - Rata-Rata : $\frac{19{,}350 + 18{,}623\%}{2}$

  : 18,986%

- Variasi Massa 0,2 gram

  # Rep 1 :

  $$R = \frac{11{,}164\ ppm - 7{,}128\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

  R = 36,156%

  # Rep 2 :

  $$R = \frac{11{,}164\ ppm - 7{,}097\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

  R = 36,428%

  - Rata-Rata : $\frac{36{,}156 + 36{,}428\%}{2}$

  : 36,292%

- Variasi Massa 0,25 gram

  # Rep 1 :

  $$R = \frac{11{,}164\ ppm - 9{,}663\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

  R = 13,445%

  # Rep 2 : Konsentrasi (C) = 10,018 ppm

  Massa (m) = 0,2507 gram

  $$R = \frac{11{,}164\ ppm - 10{,}961\ ppm}{11{,}164\ ppm}\ x\ 100\%$$

  R = 10,265%

- Rata-Rata : $\frac{13,445+10,265\%}{2}$

: 11,885%

- Variasi Massa 0,3 gram

Rep 1 :

$$R = \frac{11,164\ ppm - 9,714 ppm}{11,164\ ppm}\ x\ 100\%$$

$$R = 12,991\%$$

Rep 2 :

$$R = \frac{11,164\ ppm - 9,947\ ppm}{11,164\ ppm}\ x\ 100\%$$

$$R = 10,901\%$$

- Rata-Rata : $\frac{12,991+10,901\%}{2}$

: 11,946%

- Variasi Massa 0,4 gram

Rep 1 :

$$R = \frac{11,164\ ppm - 10,059\ ppm}{11,164\ ppm}\ x\ 100\%$$

$$R = 9,902\%$$

Rep 2 :

$$R = \frac{11,164\ ppm - 10,495\ ppm}{11,164\ ppm}\ x\ 100\%$$

$$R = 5,996\%$$

- Rata-Rata : $\frac{9,902+5,996\%}{2}$

: 7,949%

- Variasi Massa 0,5 gram

Rep 1 :

$$R = \frac{11,164\ ppm - 10,759\ ppm}{11,164\ ppm}\ x\ 100\%$$

$$R = 3,634\%$$

Rep 2 :

$$R = \frac{11,164\ ppm - 10,799\ ppm}{11,164\ ppm}\ x\ 100\%$$

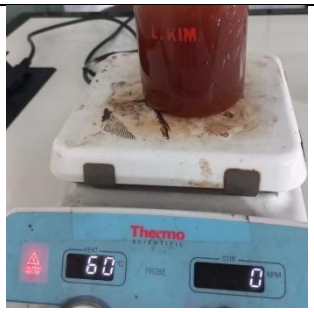
R = 3,270%

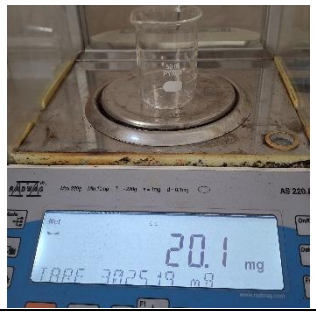
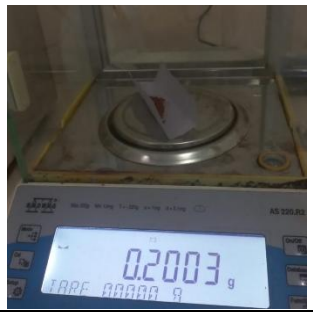
- Rata-Rata : $\frac{3,634+3,270\%}{2}$

: 3,452%

Lampiran 9. Dokumentasi

Dokumentasi	Keterangan
	Simplisia korteks Kayu Jawa (*Lannea coromandelica)* 200 mesh
	Penambahan formaldehida 37% untuk proses polimerisasi adsorben
	Penambahan H_2SO_4 0,5 N untuk proses polimerisasi adsorben
	Pemanasan pada proses polimerisasi dengan temperatur 60ºC selama 180 menit

	
	Penyaringan pada proses polimerisasi
	Pengeringan adsorben pada temperatur 60ºC untuk mencapai bobot konstan
	Penimbangan hingga bobot konstan adsorben terpolimerisasi
	Penimbangan ditizon untuk pembuatan larutan ditizon 0,0015%

	
	Penimbangan $CdSO_4.H_2O$ untuk pembuatan larutan stok Cd(II) 100 ppm
	Penimbangan variasi massa adsorben 0,2 gram
	Pengadukan larutan sampel menggunakan *shaker* dengan kecepatan 100 rpm selama 60 menit
	Penyaringan larutan sampel
	Pengondisian larutan dengan NaOH 1% hingga pH 9

	
	Pengompleksan larutan dengan ditizon 0,0015%