

LAMPIRAN

Lampiran 1. Pembuatan Larutan Induk $\text{Cd}(\text{NO}_3)_2$ 1000 ppm

Perhitungan :

Diketahui : Konsentrasi larutan induk = 1000 ppm = $\frac{1000 \text{ mg}}{\text{L}}$

Volume akhir = 100 mL

Ditanya : Massa $\text{Cd}(\text{NO}_3)_2$?

Jawab :

$$\frac{1000 \text{ mg}}{1\text{L}} = \frac{\text{massa Cd}(\text{NO}_3)_2}{\text{Volume akhir}}$$

$$\frac{1000 \text{ mg}}{1000 \text{ mL}} = \frac{\text{massa Cd}(\text{NO}_3)_2}{100 \text{ mL}}$$

$$\text{massa Cd}(\text{NO}_3)_2 = 100 \text{ mg}$$

Prosedur :

Ditimbang serbuk $\text{Cd}(\text{NO}_3)_2$ sebanyak 100 mg dan dimasukkan ke *beaker glass* 50 ml. Dilarutkan dengan sedikit akuades dan diaduk hingga larut. Setelah larut, pindahkan ke labu ukur 100 ml dan tambahkan dengan akuades hingga tanda batas. Kemudian gojok hingga homogen.

Lampiran 2. Pembuatan Larutan $\text{Cd}(\text{NO}_3)_2$ 100 ppm

Perhitungan

Diketahui : Konsentrasi larutan induk $\text{Cd}(\text{NO}_3)_2$ (M_1) = 1000 ppm

Konsentrasi larutan yang dibuat (M_2) = 100 ppm

Volume akhir (V_2) = 500 mL

Ditanya : Volume larutan induk $\text{Cd}(\text{NO}_3)_2$ 1000 ppm yang dipipet (V_1)?

Jawab :

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

$$1000 \text{ ppm} \times V_1 = 100 \text{ ppm} \times 500 \text{ mL}$$

$$V_1 = \frac{100 \text{ ppm} \times 500 \text{ mL}}{1000 \text{ ppm}}$$

$$V_1 = 50 \text{ mL}$$

Prosedur :

Dipipet 50 mL larutan induk $\text{Cd}(\text{NO}_3)_2$ 1000 ppm dan masukkan ke labu ukur 500 mL. Tambahkan akuades hingga tanda batas. Kemudian gojok hingga homogen.

Lampiran 3. Pengenceran Larutan $\text{Cd}(\text{NO}_3)_2$ 100 ppm sebanyak 25 kali

Perhitungan

Diketahui : Volume akhir (V_2) = 10 mL

Faktor pengenceran (F_p) = 25 kali

Ditanya : Volume larutan induk $\text{Cd}(\text{NO}_3)_2$ 100 ppm yang dipipet (V_1)?

Jawab :

$$F_p = \frac{V_2}{V_1}$$

$$25 = \frac{10 \text{ mL}}{V_1}$$

$$V_1 = 0,4 \text{ mL} = 400 \mu\text{L}$$

Lampiran 4. Perhitungan Kapasitas Adsorpsi

Konsentrasi Awal Cd (MBO)

$$y = 0,62653 \times C + 0,00364$$

$$0,3208 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,3208 - 0,00364}{0,62653}$$

$$C = 0,506 \text{ mg/L}$$

$$C_{\text{awal}} = C \times f_p$$

$$C_{\text{awal}} = 0,506 \times 25 \times 3$$

$$C_{\text{awal}} = 37,95 \text{ mg/L}$$

Kapasitas Adsorpsi MBA.I

$$y = 0,62653 \times C + 0,00364$$

$$0,0872 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0872 - 0,00364}{0,62653}$$

$$C = 0,13 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,13 \times 25$$

$$C \text{ akhir} = 3,325 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 3,325}{1} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,866 \text{ mg/g}$$

Kapasitas Adsorpsi MBA. II

$$y = 0,62653 \times C + 0,00364$$

$$0,0738 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0738 - 0,00364}{0,62653}$$

$$C = 0,112 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,112 \times 25$$

$$C \text{ akhir} = 2,8 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 2,8}{1} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,879 \text{ mg/g}$$

Kapasitas Adsorpsi MBA. III

$$y = 0,62653 \times C + 0,00364$$

$$0,0704 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0704 - 0,00364}{0,62653}$$

$$C = 0,107 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,107 \times 25$$

$$C \text{ akhir} = 2,675 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 2,675}{1} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,882 \text{ mg/g}$$

$$\text{Rata - Rata Kapasitas Adsorpsi MBA} = \frac{0,866 + 0,879 + 0,882}{3}$$

Rata – Rata Kapasitas Adsorpsi MBA = 0,876 mg/g

Kapasitas Adsorpsi MBB. I

$$y = 0,62653 \times C + 0,00364$$

$$0,0938 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0938 - 0,00364}{0,62653}$$

$$C = 0,144 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,144 \times 25$$

$$C \text{ akhir} = 3,6 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 3,6}{1,5} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,573 \text{ mg/g}$$

Kapasitas Adsorpsi MBB. II

$$y = 0,62653 \times C + 0,00364$$

$$0,1057 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,1057 - 0,00364}{0,62653}$$

$$C = 0,163 \text{ mg/L}$$

$$C_{akhir} = C \times fp$$

$$C_{akhir} = 0,163 \times 25$$

$$C_{akhir} = 4,075 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C_{awal} - C_{akhir} \text{ (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 4,075}{1,5} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,565 \text{ mg/g}$$

Kapasitas Adsorpsi MBB. III

$$y = 0,62653 \times C + 0,00364$$

$$0,0989 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0989 - 0,00364}{0,62653}$$

$$C = 0,152 \text{ mg/L}$$

$$C_{akhir} = C \times fp$$

$$C_{akhir} = 0,152 \times 25$$

$$C_{akhir} = 3,8 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C_{awal} - C_{akhir} \text{ (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 3,8}{1,5} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,569 \text{ mg/g}$$

$$\text{Rata – Rata Kapasitas Adsorpsi MBB} = \frac{0,573 + 0,565 + 0,569}{3}$$

$$\text{Rata – Rata Kapasitas Adsorpsi MBB} = 0,563 \text{ mg/g}$$

Kapasitas Adsorpsi MBC. I

$$y = 0,62653 \times C + 0,00364$$

$$0,0531 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0531 - 0,00364}{0,62653}$$

$$C = 0,079 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,079 \times 25$$

$$C \text{ akhir} = 1,975 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 1,975}{2} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,45 \text{ mg/g}$$

Kapasitas Adsorpsi MBC. II

$$y = 0,62653 \times C + 0,00364$$

$$0,0334 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0334 - 0,00364}{0,62653}$$

$$C = 0,047 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,047 \times 25$$

$$C \text{ akhir} = 1,175 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 1,175}{2} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 0,46 \text{ mg/g}$$

Kapasitas Adsorpsi MBC. III

$$y = 0,62653 \times C + 0,00364$$

$$0,0444 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0444 - 0,00364}{0,62653}$$

$$C = 0,065 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,065 \times 25$$

$$C \text{ akhir} = 1,625 \text{ mg/L}$$

$$Kapasitas Adsorpsi = \frac{C_{awal} - C_{akhir} (mg/L)}{massa biosorben (g)} \times Volume adsorbat (L)$$

$$Kapasitas Adsorpsi = \frac{37,95 - 1,625}{2} \times 0,025$$

$$Kapasitas Adsorpsi = 0,454 \text{ mg/g}$$

$$Rata - Rata Kapasitas Adsorpsi MBC = \frac{0,45 + 0,46 + 0,454}{3}$$

$$Rata - Rata Kapasitas Adsorpsi MBC = 0,455 \text{ mg/g}$$

Kapasitas Adsorpsi MBD. I

$$y = 0,62653 \times C + 0,00364$$

$$0,0136 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0136 - 0,00364}{0,62653}$$

$$C = 0,016 \text{ mg/L}$$

$$C_{akhir} = C \times fp$$

$$C_{akhir} = 0,016 \times 25$$

$$C_{akhir} = 0,4 \text{ mg/L}$$

$$Kapasitas Adsorpsi = \frac{C_{awal} - C_{akhir} (mg/L)}{massa biosorben (g)} \times Volume adsorbat (L)$$

$$Kapasitas Adsorpsi = \frac{37,95 - 0,4}{0,5} \times 0,025$$

$$Kapasitas Adsorpsi = 1,877 \text{ mg/g}$$

Kapasitas Adsorpsi MBD. II

$$y = 0,62653 \times C + 0,00364$$

$$0,0156 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0156 - 0,00364}{0,62653}$$

$$C = 0,019 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,019 \times 25$$

$$C \text{ akhir} = 0,475 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 0,475}{0,5} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 1,874 \text{ mg/g}$$

Kapasitas Adsorpsi MBD. III

$$y = 0,62653 \times C + 0,00364$$

$$0,0147 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0147 - 0,00364}{0,62653}$$

$$C = 0,018 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,018 \times 25$$

$$C_{akhir} = 0,45 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C_{awal} - C_{akhir} \text{ (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 0,45}{0,5} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 1,875 \text{ mg/g}$$

$$\text{Rata - Rata Kapasitas Adsorpsi MBD} = \frac{1,877 + 1,874 + 1,875}{3}$$

$$\text{Rata - Rata Kapasitas Adsorpsi MBD} = 1,875 \text{ mg/g}$$

Kapasitas Adsorpsi MBE. I

$$y = 0,62653 \times C + 0,00364$$

$$0,0049 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0049 - 0,00364}{0,62653}$$

$$C = 0,002 \text{ mg/L}$$

$$C_{akhir} = C \times fp$$

$$C_{akhir} = 0,002 \times 25$$

$$C_{akhir} = 0,05 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C_{awal} - C_{akhir} \text{ (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 0,05}{0,1} \times 0,025$$

$$Kapasitas Adsorpsi = 9,475 \text{ mg/g}$$

Kapasitas Adsorpsi MBE. II

$$y = 0,62653 \times C + 0,00364$$

$$0,0051 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0051 - 0,00364}{0,62653}$$

$$C = 0,002 \text{ mg/L}$$

$$C \text{ akhir} = C \times fp$$

$$C \text{ akhir} = 0,002 \times 25$$

$$C \text{ akhir} = 0,05 \text{ mg/L}$$

$$Kapasitas Adsorpsi = \frac{C \text{ awal} - C \text{ akhir (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$Kapasitas Adsorpsi = \frac{37,95 - 0,05}{0,1} \times 0,025$$

$$Kapasitas Adsorpsi = 9,475 \text{ mg/g}$$

Kapasitas Adsorpsi MBE. III

$$y = 0,62653 \times C + 0,00364$$

$$0,0059 = 0,62653 \times C + 0,00364$$

$$C = \frac{0,0059 - 0,00364}{0,62653}$$

$$C = 0,004 \text{ mg/L}$$

$$C_{akhir} = C \times fp$$

$$C_{akhir} = 0,004 \times 25$$

$$C_{akhir} = 0,1 \text{ mg/L}$$

$$\text{Kapasitas Adsorpsi} = \frac{C_{awal} - C_{akhir} \text{ (mg/L)}}{\text{massa biosorben (g)}} \times \text{Volume adsorbat (L)}$$

$$\text{Kapasitas Adsorpsi} = \frac{37,95 - 0,1}{0,1} \times 0,025$$

$$\text{Kapasitas Adsorpsi} = 9,462 \text{ mg/g}$$

$$\text{Rata - Rata Kapasitas Adsorpsi MBE} = \frac{9,475 + 9,475 + 9,462}{3}$$

$$\text{Rata - Rata Kapasitas Adsorpsi MBE} = 9,47 \text{ mg/g}$$