

## DAFTAR PUSTAKA

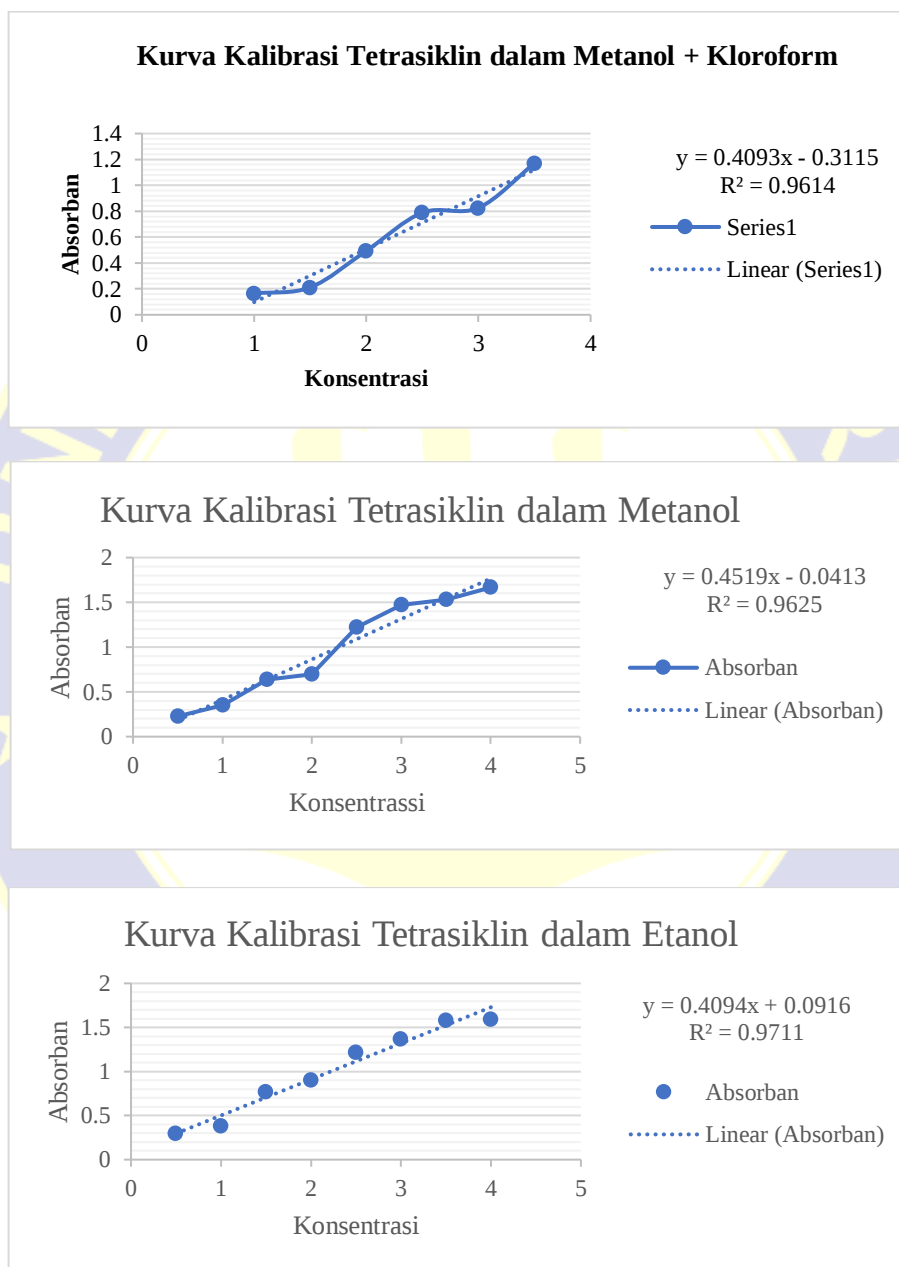
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## LAMPIRAN 1

### UJI LINIERITAS



**Gambar V. 1** Kurva Kalibrasi Tetrasiklin Dalam Pelarut Kloroform : Metanol, Metanol dan Etanol

## LAMPIRAN 2

## UJI PRESISI

**Tabel V. 3**  
Data Hasil Uji Presisi Tetrasiklin Dengan Pelarut Metanol

| Konsentrasi (ppm) | Absorban | X            | X <sup>2</sup> |
|-------------------|----------|--------------|----------------|
| 1                 | 0,470    | 1,333        | 2,2680         |
| 1                 | 0,471    | 1,135        | 2,2590         |
| 1                 | 0,472    | 1,137        | 2,2530         |
| 1                 | 0,490    | 1,177        | 2,2530         |
| 1                 | 0,491    | 1,179        | 2,2680         |
| 1                 | 0,492    | 1,181        | 2,2590         |
| $\Sigma$          |          | <b>7,142</b> | <b>8,53</b>    |
| <b>Rata-rata</b>  |          | <b>1,190</b> |                |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,451x - 0,041; R^2 = 0,962$$

$$SD = \frac{n \cdot \Sigma x^2 - (\Sigma x)^2}{n(n-1)}$$

$$SD = \frac{6 \cdot 8,53 - 51,0081}{6 \cdot (6-1)} = \frac{0,1719}{30} = 0,0057$$

$$\%RSD = \frac{SD}{x} \times 100\%$$

$$\%RSD = \frac{0,0057}{1,190} \times 100\% = -0,478\%$$

$$\%Ketelitian \text{ alat} = 100\% - \frac{SD}{x}$$

$$\%Ketelitian \text{ alat} = 100\% - \frac{0,0057}{1,190} = 99,9\%$$

## LAMPIRAN 2 (LANJUTAN)

**Tabel V. 4**  
Data Hasil Uji Presisi Tetrasiklin Dengan Pelarut Etanol

| Konsentrasi (ppm) | Absorban | X            | X <sup>2</sup> |
|-------------------|----------|--------------|----------------|
| 1                 | 0,353    | 0,985        | 2,2680         |
| 1                 | 0,354    | 0,987        | 2,2590         |
| 1                 | 0,355    | 0,989        | 2,2530         |
| 1                 | 0,354    | 0,987        | 2,2530         |
| 1                 | 0,355    | 0,989        | 2,2680         |
| 1                 | 0,356    | 0,991        | 2,2590         |
| <b>Σ</b>          |          | <b>5,928</b> | <b>5,85</b>    |
| <b>Rata-rata</b>  |          | <b>0,988</b> |                |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,409x + 0,091 ; R^2 = 0,971$$

$$SD = \frac{n \cdot \Sigma x^2 - (\Sigma x)^2}{n(n-1)}$$

$$SD = \frac{6 \cdot 5,85 - 35,1411}{6 \cdot (6-1)} = \frac{-0,0004}{30} = -0,0013$$

$$\%RSD = \frac{SD}{x} \times 100\%$$

$$\%RSD = \frac{-0,0013}{0,988} \times 100\% = -0,131\%$$

$$\%Ketelitian \text{ alat} = 100\% - \frac{SD}{x}$$

$$\%Ketelitian \text{ alat} = 100\% - \frac{-0,0013}{0,988} = 100,001\%$$

## LAMPIRAN 2 (LANJUTAN)

**Tabel V. 5**

Data Hasil Uji Presisi Tetrasiklin Dengan Pelarut Kloroform + Metanol

| Konsentrasi (ppm) | Absorban | X            | X <sup>2</sup> |
|-------------------|----------|--------------|----------------|
| 1                 | 0,305    | 1,506        | 2,2680         |
| 1                 | 0,304    | 1,503        | 2,2590         |
| 1                 | 0,303    | 1,501        | 2,2530         |
| 1                 | 0,303    | 1,501        | 2,2530         |
| 1                 | 0,305    | 1,506        | 2,2680         |
| 1                 | 0,304    | 1,503        | 2,2590         |
| <b>Σ</b>          |          | <b>9,02</b>  | <b>13,56</b>   |
| <b>Rata-rata</b>  |          | <b>1,503</b> |                |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,409x - 0,311; R^2 = 0,962$$

$$SD = \frac{n \cdot \Sigma x^2 - (\Sigma x)^2}{n(n-1)}$$

$$SD = \frac{6 \cdot 13,56 - 81,3604}{6 \cdot (6-1)} = \frac{-0,0004}{30} = -0,00001$$

$$\%RSD = \frac{SD}{x} \times 100\%$$

$$\%RSD = \frac{-0,00001}{1,503} \times 100\% = -0,0006\%$$

$$\%Ketelitian \text{ alat} = 100\% - \frac{SD}{x}$$

$$\%Ketelitian \text{ alat} = 100\% - \frac{-0,00001}{1,503} = 100\%$$

## LAMPIRAN 3

## UJI AKURASI

**Tabel V. 6**  
Data Hasil Uji Akurasi Tetrasiklin Dengan Pelarut Metanol

| Konsentrasi (ppm) | Absorban | Csebenarnya | %Recovery |
|-------------------|----------|-------------|-----------|
| 1,2               | 0,511    | 1,22        | 101,6%    |
| 1,5               | 0,639    | 1,50        | 100%      |
| 1,8               | 0,766    | 1,78        | 98,88%    |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,451x - 0,041; R^2 = 0,962$$

**1,2 ppm**

$$C \text{ Sebenarnya} = \frac{0,511 + 0,041}{0,451} = 1,22$$

$$\%Recovery = \frac{1,22}{1,2} \times 100\% = 101,6\%$$

**1,5 ppm**

$$C \text{ Sebenarnya} = \frac{0,639 + 0,041}{0,451} = 1,50$$

$$\%Recovery = \frac{1,50}{1,5} \times 100\% = 100\%$$

**1,8 ppm**

$$C \text{ Sebenarnya} = \frac{0,766 + 0,041}{1,8} = 1,78$$

$$\%Recovery = \frac{1,78}{1,8} \times 100\% = 98,88\%$$

### LAMPIRAN 3 (LANJUTAN)

**Tabel V. 7**  
Data Hasil Uji Akurasi Tetrasiklin Dengan Pelarut Etanol

| Konsentrasi (ppm) | Absorban | C sebenarnya | %Recovery |
|-------------------|----------|--------------|-----------|
| 3,2               | 1,27     | 3,32         | 103,7%    |
| 4                 | 1,594    | 4,11         | 102,7%    |
| 4,8               | 1,912    | 4,89         | 101,8%    |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,409x + 0,091; R^2 = 0,971$$

**3,2 ppm**

$$C \text{ Sebenarnya} = \frac{1,27 + 0,091}{0,409} = 3,32$$

$$\%Recovery = \frac{3,32}{3,2} \times 100\% = 103,7\%$$

**4 ppm**

$$C \text{ Sebenarnya} = \frac{1,594 + 0,091}{0,409} = 4,11$$

$$\%Recovery = \frac{4,11}{4} \times 100\% = 102,7\%$$

**4,8 ppm**

$$C \text{ Sebenarnya} = \frac{1,912 + 0,091}{0,409} = 4,89$$

$$\%Recovery = \frac{4,89}{4,8} \times 100\% = 101,8\%$$

### LAMPIRAN 3 (LANJUTAN)

**Tabel V. 8**

Data Hasil Uji Akurasi Tetrasiklin Dengan Pelarut Kloroform + Metanol

| Konsentrasi (ppm) | Absorban | C sebenarnya | %Recovery |
|-------------------|----------|--------------|-----------|
| 1,6               | 0,395    | 1,72         | 107,5%    |
| 2                 | 0,494    | 1,96         | 98%       |
| 2,4               | 0,592    | 2,20         | 91,6%     |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,409x + 0,311; R^2 = 0,961$$

**1,6 ppm**

$$C \text{ Sebenarnya} = \frac{0,395 + 0,311}{0,409} = 1,72$$

$$\%Recovery = \frac{1,72}{1,6} \times 100\% = 107,5\%$$

**2 ppm**

$$C \text{ Sebenarnya} = \frac{0,494 + 0,311}{0,409} = 1,96$$

$$\%Recovery = \frac{1,96}{2} \times 100\% = 98\%$$

**2,4 ppm**

$$C \text{ Sebenarnya} = \frac{0,592 + 0,311}{0,409} = 2,20$$

$$\%Recovery = \frac{2,20}{2,4} \times 100\% = 91,6\%$$

**LAMPIRAN 4**  
**NILAI LOD DAN LOQ**

**Tabel V. 9**  
Data Hasil Penentuan LOD Dan LOQ Tetrasiklin Dengan Pelarut Metanol

| <b>X (ppm)</b> | <b>Y</b> | <b>Yi</b> | <b>y-yi</b> | <b>(y-yi)<sup>2</sup></b> |
|----------------|----------|-----------|-------------|---------------------------|
| 0,5            | 0,227    | 0,184     | 0,043       | 0,001                     |
| 1              | 0,353    | 0,41      | -0,057      | 0,003                     |
| 1,5            | 0,639    | 0,635     | 0,004       | 0,000016                  |
| 2              | 0,698    | 0,861     | -0,163      | 0,026                     |
| 2,5            | 1,220    | 1,086     | 0,134       | 0,017                     |
| 3              | 1,469    | 1,312     | 0,157       | 0,024                     |
| 3,5            | 1,532    | 1,537     | -0,005      | 0,000025                  |
| 4              | 1,666    | 1,763     | -0,097      | 0,009                     |
| <b>Σ</b>       |          |           |             | <b>0,080</b>              |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,451x - 0,041; R^2 = 0,962$$

Contoh perhitungan yi (adsorban hitungan)

$$y = bx + a$$

$$y = 0,451 \cdot 0,5 - 0,041$$

$$y = 0,225 - 0,041$$

$$y = 0,184$$

$$SB = \sqrt{\frac{\Sigma(y - y_i)^2}{n - 2}} = \sqrt{\frac{0,080}{6 - 2}} = 0,141$$

$$LOD = \frac{3 \times SB}{slope} = \frac{3 \times 0,141}{0,451} = 0,937 \text{ ppm}$$

$$LOQ = \frac{10 \times SB}{slope} = \frac{10 \times 0,141}{0,451} = 3,126 \text{ ppm}$$

## LAMPIRAN 4 (LANJUTAN)

**Tabel V. 10**  
Data Hasil Penentuan LOD Dan LOQ Tetrasiklin Dengan Pelarut Etanol

| <b>X (ppm)</b> | <b>Y</b> | <b>Yi</b> | <b>y-yi</b> | <b>(y-yi)<sup>2</sup></b> |
|----------------|----------|-----------|-------------|---------------------------|
| 0,5            | 0,297    | 0,295     | 0,002       | 0,000004                  |
| 1              | 0,378    | 0,5       | -0,122      | 0,014                     |
| 1,5            | 0,768    | 0,704     | 0,064       | 0,004                     |
| 2              | 0,904    | 0,909     | -0,005      | 0,000025                  |
| 2,5            | 1,124    | 1,113     | 0,011       | 0,0001                    |
| 3              | 1,368    | 1,318     | 0,05        | 0,0025                    |
| 3,5            | 1,579    | 1,522     | 0,057       | 0,0032                    |
| 4              | 1,594    | 1,727     | -0,133      | 0,017                     |
| <b>Σ</b>       |          |           |             | <b>0,040</b>              |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,409x + 0,091; R^2 = 0,971$$

Contoh perhitungan yi (adsorban hitungan)

$$y = bx + a$$

$$y = 0,409 \cdot 0,5 + 0,091$$

$$y = 0,204 + 0,091$$

$$y = 0,295$$

$$SB = \sqrt{\frac{\Sigma(y - y_i)^2}{n - 2}} = \sqrt{\frac{0,040}{8 - 2}} = 0,077$$

$$LOD = \frac{3 \times SB}{slope} = \frac{3 \times 0,077}{0,409} = 0,564 \text{ ppm}$$

$$LOQ = \frac{10 \times SB}{slope} = \frac{10 \times 0,077}{0,409} = 1,882 \text{ ppm}$$

#### LAMPIRAN 4 (LANJUTAN)

**Tabel V. 11**  
Data Hasil Penentuan LOD Dan LOQ Tetrasiklin Dengan Pelarut Kloroform + Metanol

| X (ppm)  | Y     | Yi    | y-yi   | (y-yi) <sup>2</sup> |
|----------|-------|-------|--------|---------------------|
| 1        | 0,165 | 0,098 | 0,067  | 0,004               |
| 1,5      | 0,212 | 0,302 | -0,09  | 0,008               |
| 2        | 0,494 | 0,507 | -0,013 | 0,000169            |
| 2,5      | 0,789 | 0,711 | 0,078  | 0,006               |
| 3        | 0,826 | 0,916 | -0,09  | 0,008               |
| 3,5      | 1,170 | 1,12  | -0,05  | 0,002               |
| <b>Σ</b> |       |       |        | <b>0,028</b>        |

Diperoleh kurva kalibrasi  $y = bx + a$

$$y = 0,409x + 0,311; R^2 = 0,961$$

Contoh perhitungan yi (adsorban hitungan)

$$y = bx + a$$

$$y = 0,409 \cdot 1 - 0,311$$

$$y = 0,409 - 0,311$$

$$y = 0,098$$

$$SB = \sqrt{\frac{\Sigma(y - yi)^2}{n - 2}} = \sqrt{\frac{0,028}{6 - 2}} = 0,083$$

$$LOD = \frac{3 \times SB}{slope} = \frac{3 \times 0,083}{0,409} = 0,608 \text{ ppm}$$

$$LOQ = \frac{10 \times SB}{slope} = \frac{10 \times 0,083}{0,409} = 2,029 \text{ ppm}$$

## LAMPIRAN 5

### SINTESIS DAN EKSTRAKSI MIP DAN NIP POLIMERISASI RUAH

**Tabel V. 12**

Hasil Sintesis Polimer MIP Dan NIP Dengan Metode Ruah

| Polimer | Warna        | Massa  |
|---------|--------------|--------|
| MIP     | Kuning Pucat | 6,7459 |
| NIP     | Putih        | 6,6715 |

**Tabel V. 13**

Hasil Pengukuran Dari Ekstraksi Menggunakan Spektrofotometer UV-Vis

| Waktu Ekstraksi | Absorbansi (380 nm) |
|-----------------|---------------------|
| 24 jam ke-1     | 0,112               |
| 24 jam ke-2     | 0,062               |
| 24 jam ke-3     | 0,026               |
| 24 jam ke-4     | 0,019               |
| 24 jam ke-5     | 0,008               |

## LAMPIRAN 6

## UJI KEMAMPUAN ADSORPSI

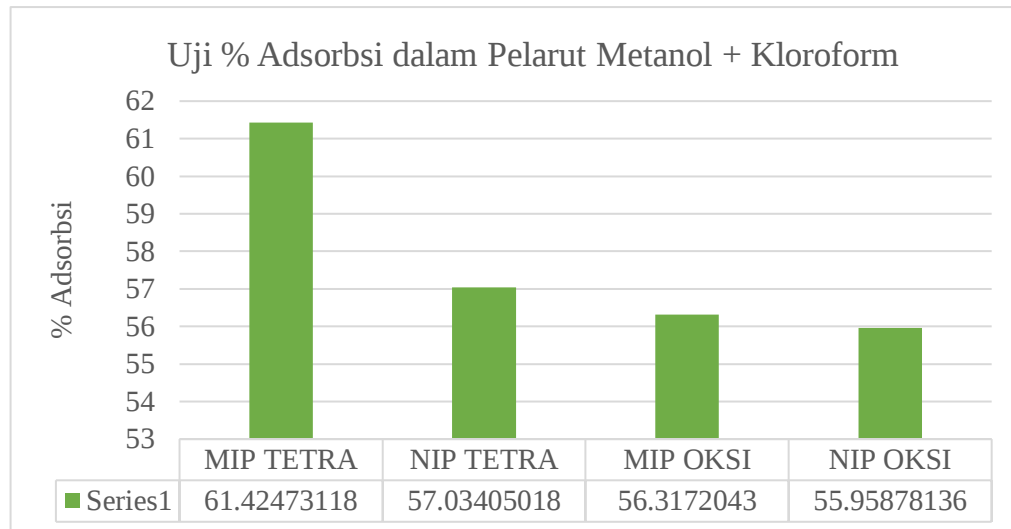
Tabel V. 14

Hasil Uji Kemampuan Adsorpsi Pada Pelarut Etanol, Methanol Dan Kloroform+Methanol

| Pelarut           | MIP      |           | NIP      |           | Absorban Tetrasiklin |
|-------------------|----------|-----------|----------|-----------|----------------------|
|                   | Absorban | Rata-rata | Absorban | Rata-rata |                      |
| Metanol           | 0,202    | 0,210     | 0,226    | 0,232     | 0,314                |
|                   | 0,201    |           | 0,230    |           |                      |
|                   | 0,229    |           | 0,242    |           |                      |
| Etanol            | 0,224    | 0,214     | 0,232    | 0,227     | 0,360                |
|                   | 0,210    |           | 0,228    |           |                      |
|                   | 0,208    |           | 0,221    |           |                      |
| Kloroform-Metanol | 0,201    | 0,201     | 0,206    | 0,206     | 0,420                |
|                   | 0,201    |           | 0,205    |           |                      |
|                   | 0,201    |           | 0,208    |           |                      |

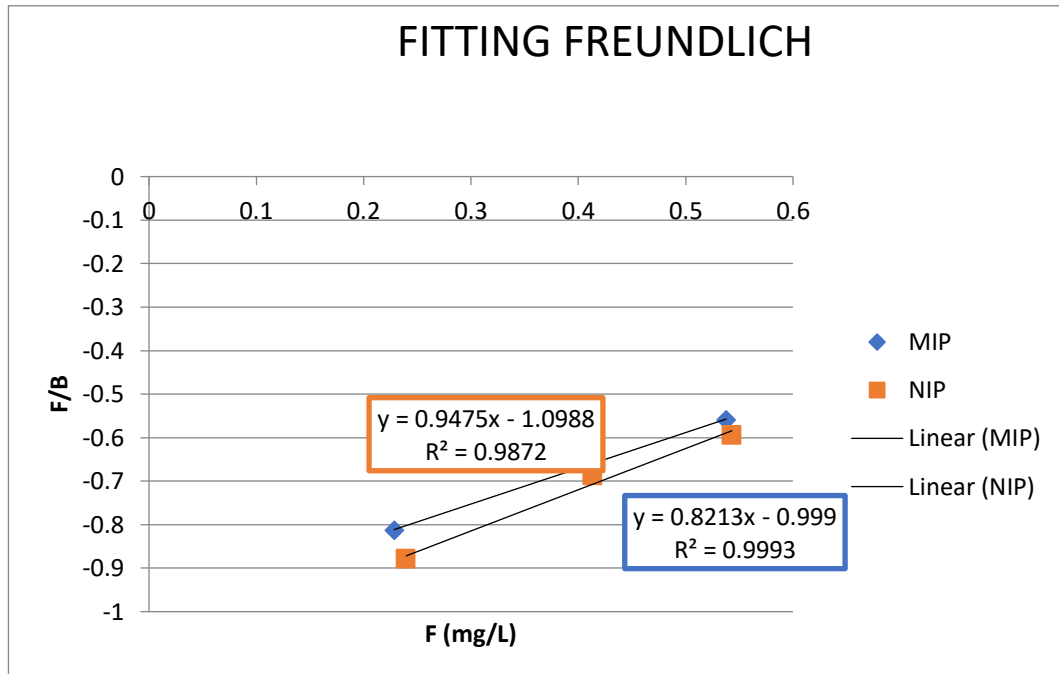
| Pelarut           | Absorban |       | %Recovery |        |
|-------------------|----------|-------|-----------|--------|
|                   | MIP      | NIP   | MIP       | NIP    |
| Metanol           | 0,103    | 0,081 | 32,91     | 25,90% |
| Etanol            | 0,146    | 0,133 | 40,56%    | 36,94% |
| Kloroform-Metanol | 0,219    | 0,213 | 52,14%    | 50,87% |

**LAMPIRAN 6  
(LANJUTAN)**



**Gambar V. 2** Grafik Uji Kemampuan % Adsorpsi Sorben MIP Dan NIP

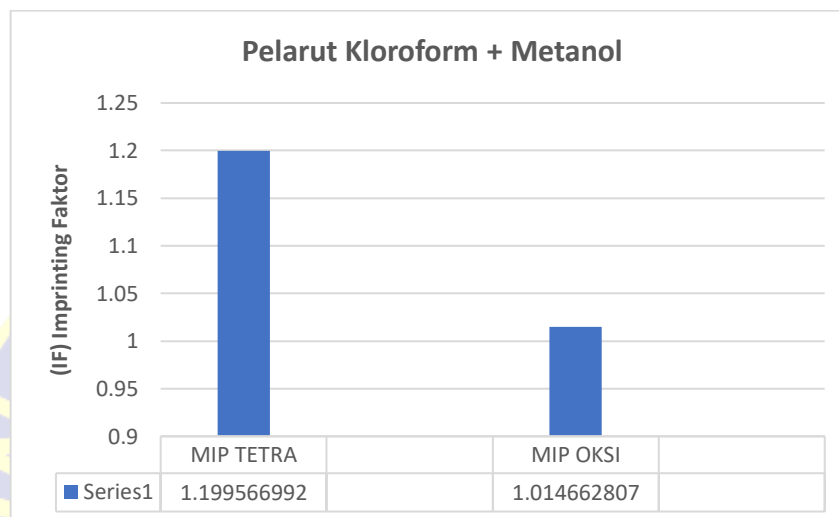
**LAMPIRAN 7**  
**UJI KAPASITAS ADSORPSI**



**Gambar V. 3** Kurva Uji Kapasitas Adsorpsi Tetrasiklin Pada Kloroform - Metanol

## LAMPIRAN 8

## UJI SELEKTIVITAS SORBEN MIP DAN NIP

**Gambar V. 4** Grafik Nilai Imprinting Faktor (IF)**Tabel V. 15**  
Hasil Perhitungan KD Dan IF

| Zat             | KD        |           | IF       |
|-----------------|-----------|-----------|----------|
|                 | MIP       | NIP       |          |
| Tetrasiklin     | 0,7961672 | 0,6637122 | 1,199567 |
| Oksitetrasiklin | 0,6446154 | 0,6353001 | 1,014663 |

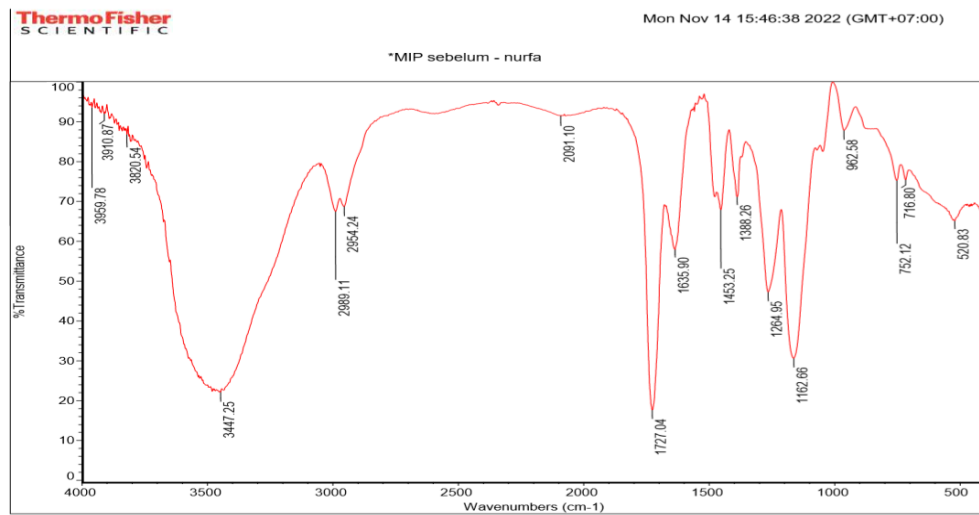
Keterangan :

KD : Koefesien determinasi

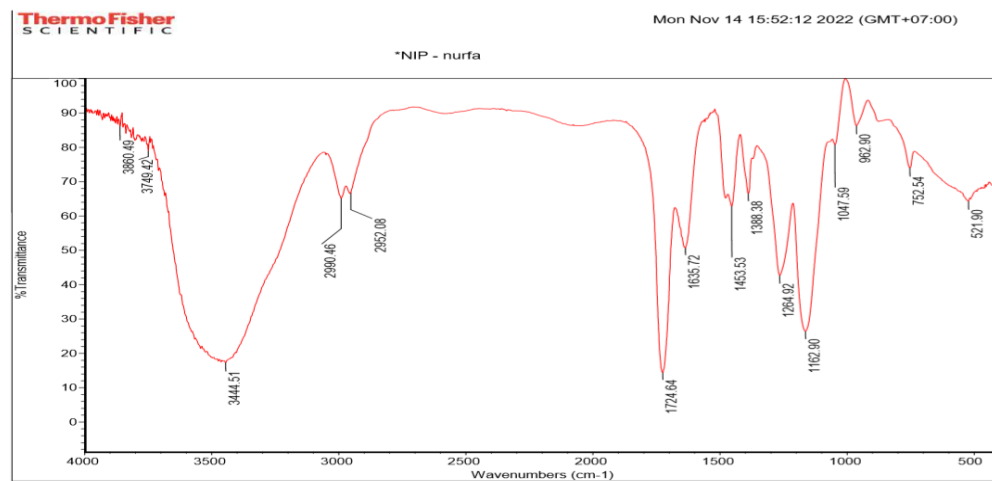
IF : Imprinting factor

## LAMPIRAN 9

### HASIL KARAKTERISASI FISIK DENGAN FTIR

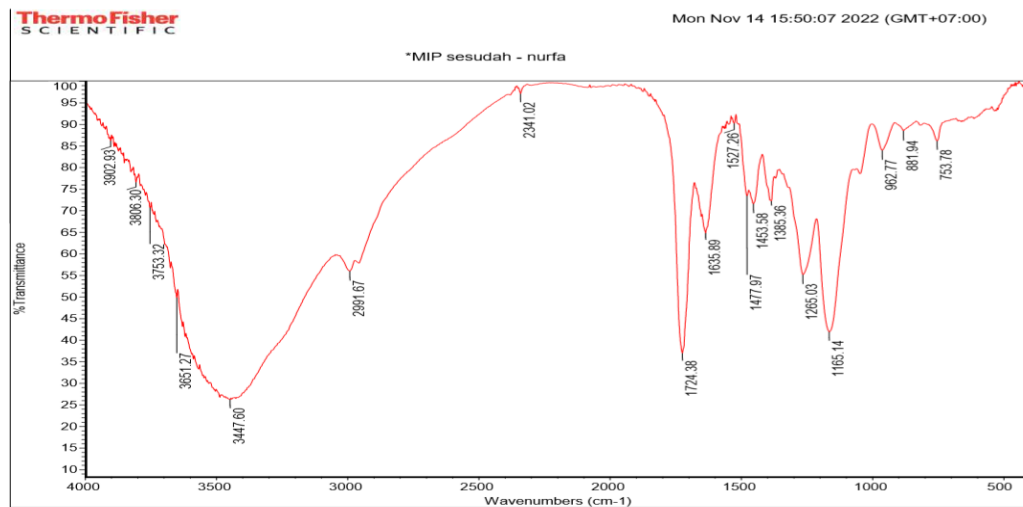


- a) Spektrum FTIR sorben MIP Tetrasiklin sebelum ekstraksi pada pelarut kloroform – etanol



- b) Spektrum FTIR sorben NIP Tetrasiklin pada pelarut kloroform - metanol

## LAMPIRAN 9 (LANJUTAN)



c) Spektrum FTIR sorben MIP Tetrasiklin sesudah ekstraksi pada pelarut kloroform – methanol

**Gambar V. 5** Spektrum FTIR Sorben MIP Sebelum Diekstraksi, MIP Setelah Diekstraksi, Dan NIP Tetrasiklin Pada Pelarut Kloroform - Metanol

## LAMPIRAN 10

## CERTIFICATE OF ANALYSIS



3050 Spruce Street  
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## Product Information

## TETRACYCLINE

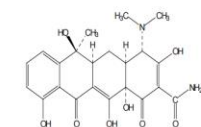
Product Number T 3258

CAS NUMBER: 60-54-8  
SYNONYMS: Abromycin; Abrocyline; Agromicina;  
Ambramicina; Ambramycin; Amycin; Biotetra;  
Bristacidin Alpha; Cefracycline Suspension;  
Crisociclina; Democyclin; Deschlorobromycin;  
Hostacyclin; Liqumycin; 6-methyl-1,  
11-dioxo-2-naphthacene-3-carboxamide; Neocycline;  
Oleatrin; Omegamycin; Olyocyline; Parnamycin;  
Purocycline; Purocyclina; Roblet; Sandomycin;  
Sigmamycin; Stedin; Tetabon; Tetracycline;  
Tetracycline I; Tetracycline II; 3K-Tetracycline;  
Tetraon; Tetradecin; Tetravetine; Tsklomistin;  
T-125; Veracin; Velacyclinum

## Product Description

Molecular formula:  $C_{22}H_{26}N_2O_5$   
Formula weight: 444.4 (anhydrous)  
 $pK_a$ : 8.3, 10.2 (50% aqueous DMF)  
 $\lambda_{max}$ : 220, 260, 355 nm ( $\epsilon^{25^\circ}$  = 13, 18.04, 13.32) for  
free base in 0.1 M HCl<sup>1</sup>  
Specific Rotation: -257.9° (0.1 M HCl at 25 °C)<sup>1</sup>  
-239° (methanol at 25 °C)<sup>2</sup>

Tetracyclines possess a wide range of antimicrobial activity against gram-positive and gram-negative bacteria. The bacterial ribosome is the site of action of tetracyclines. Access to the ribosomes of gram-negative bacteria is obtained by passive diffusion through hydrophilic pores in the outer cell membrane and then by an energy-dependent active transport system that pumps all tetracyclines through the inner cytoplasmic membrane. This active transport system may require a periplasmic protein carrier. Tetracyclines bind specifically to 30S ribosomes and appear to inhibit protein synthesis by preventing access of aminoacyl-tRNA to the acceptor site on the mRNA-ribosome complex. The inhibitory effects of the tetracyclines can be reversed by washing. This suggests that the reversibly bound antibiotic rather than the small portion of irreversibly bound drug is responsible for the antibacterial action.<sup>2</sup>



## Preparation Instructions

Tetracycline as a free base is soluble 1 in 2500 of water and 1 in 50 of alcohol; soluble in methanol, but sparingly soluble in acetone; freely soluble in dilute acids and, with decomposition, in solutions of alkali hydroxides, but practically insoluble in chloroform and ether.<sup>2</sup>

The product is soluble in 1 M HCl with heating (50 mg/mL), yielding a clear to slightly hazy yellow to orange-brown solution. Tetracycline undergoes reversible epimerizations in solution to the less active 4-epitetracycline; the degree of epimerization is dependent on pH and is greatest at a pH of approximately 3.

Epimerization has been observed to be the dominant degradation reaction at pH 2.5 to 5. Formation of anhydrotetracycline occurs at a very low pH and oxidation to isotetracycline occurs at alkaline pH. Tetracycline's potency is reduced in solutions with a pH below 2. The pH of a 1% suspension in water may range from 3.0 to 7.0.<sup>2</sup>

## Storage/Stability

This product should be stored in the freezer. The product will darken in moist air when exposed to strong sunlight.<sup>2</sup>

## References

1. The Merck Index, 12<sup>th</sup> ed., #6337 (1996).
2. Martindale The Extra Pharmacopoeia, 30<sup>th</sup> ed., 212-213 (1993).

3. Goodman and Gilman's The Pharmacological Basis of Therapeutics, 7<sup>th</sup> ed., 1170-1171 (1985).

JWM 7/8/2003

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Gambar V. 6 Certificate Of Analysis Tetrasiklin

## LAMPIRAN 10

### (LANJUTAN)



## Certificate of Analysis

1.02445.2500 Chloroform for analysis EMSURE® ACS,ISO,Reag. Ph Eur  
Batch K52519845

|                                                            | Spec. Values  |       | Batch Values |       |
|------------------------------------------------------------|---------------|-------|--------------|-------|
| Purity (GC)                                                | 99.0 - 99.4   | %     | 99.3         | %     |
| Assay (according to ACS)                                   | ≥ 99.8        | %     | 99.9         | %     |
| Identity (IR)                                              | conforms      |       | conforms     |       |
| Appearance                                                 | clear         |       | clear        |       |
| Color                                                      | ≤ 10          | Hazen | < 5          | Hazen |
| Free acid (as HCl)                                         | ≤ 0.0002      | %     | 0.0001       | %     |
| Density (d 20 °C/20 °C)                                    | 1.475 - 1.481 |       | 1.481        |       |
| Boiling point                                              | 60 - 62       | °C    | 61           | °C    |
| Acid and chloride                                          | conforms      |       | conforms     |       |
| Chloride (Cl)                                              | ≤ 0.00002     | %     | ≤ 0.00002    | %     |
| Free chlorine                                              | ≤ 0.00003     | %     | ≤ 0.00003    | %     |
| Carbonyl compounds (as CO)                                 | ≤ 0.005       | %     | ≤ 0.005      | %     |
| Readily carbonizable substances                            | conforms      |       | conforms     |       |
| Ethanol (GC)                                               | 0.6 - 1.0     | %     | 0.7          | %     |
| Dichloromethane (GC)                                       | ≤ 0.01        | %     | < 0.01       | %     |
| Carbon tetrachloride (GC)                                  | ≤ 0.01        | %     | < 0.01       | %     |
| Tetrachloroethylene (GC)                                   | ≤ 0.01        | %     | < 0.01       | %     |
| Trichloroethylene (GC)                                     | ≤ 0.01        | %     | < 0.01       | %     |
| Related substances (GC)                                    | ≤ 0.7         | %     | < 0.7        | %     |
| Aldehydes and ketones (as C <sub>3</sub> H <sub>6</sub> O) | ≤ 0.001       | %     | ≤ 0.001      | %     |
| Suitability for determination with dithizone               | conforms      |       | conforms     |       |
| Al (Aluminium)                                             | ≤ 0.00005     | %     | ≤ 0.00005    | %     |
| B (Boron)                                                  | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Ba (Barium)                                                | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Ca (Calcium)                                               | ≤ 0.00005     | %     | ≤ 0.00005    | %     |
| Cd (Cadmium)                                               | ≤ 0.000005    | %     | ≤ 0.000005   | %     |
| Co (Cobalt)                                                | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Cr (Chromium)                                              | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Cu (Copper)                                                | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Fe (Iron)                                                  | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Mg (Magnesium)                                             | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Mn (Manganese)                                             | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Mo (Molybdenum)                                            | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Ni (Nickel)                                                | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Pb (Lead)                                                  | ≤ 0.000005    | %     | ≤ 0.000005   | %     |
| Sn (Tin)                                                   | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Zn (Zinc)                                                  | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Evaporation residue                                        | ≤ 0.001       | %     | < 0.001      | %     |
| Water                                                      | ≤ 0.01        | %     | < 0.01       | %     |

Stabilized with 0,6-1,0% Ethanol

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**Gambar V. 7** Certificate Of Analysis Kloroform

## LAMPIRAN 10 (LANJUTAN)



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 Email USA: [techserv@sigmaaldrich.com](mailto:techserv@sigmaaldrich.com)  
 Outside USA: [eurtechserv@sigmaaldrich.com](mailto:eurtechserv@sigmaaldrich.com)

**Certificate of Analysis**

Product Name: Azobisisobutyronitrile - 12 wt. % in acetone

Product Number: 768375

Batch Number: MKCQ0303

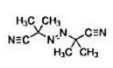
Brand: ALDRICH

Formula: C<sub>8</sub>H<sub>12</sub>N<sub>4</sub>

Formula Weight: 164.21 g/mol

Storage Temperature: Store at 2 - 8 °C

Quality Release Date: 16 AUG 2021



| Test                         | Specification             | Result    |
|------------------------------|---------------------------|-----------|
| Appearance (Color)           | Colorless to Faint Yellow | Colorless |
| Appearance (Form)            | Liquid                    | Liquid    |
| Proton NMR Spectrum          | Conforms to Structure     | Conforms  |
| Azobisisobutyronitrile       | 11 - 14 % wt              | 12 % wt   |
| <sup>13</sup> C NMR Spectrum | Conforms to Structure     | Conforms  |
| GCMS                         | Conforms to Structure     | Conforms  |



Larry Coers, Director  
Quality Control  
Milwaukee, WI US

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at [Sigma-Aldrich.com](http://Sigma-Aldrich.com). For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of Invoice or packing slip for additional terms and conditions of sale.

Version Number: 1
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**Gambar V. 8** Certificate Of Analysis AIBN

## LAMPIRAN 10

### (LANJUTAN)

**SIGMA-ALDRICH**<sup>®</sup>

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Email USA: [techserv@sigmaaldrich.com](mailto:techserv@sigmaaldrich.com)  
Outside USA: [eurtechserv@sigmaaldrich.com](mailto:eurtechserv@sigmaaldrich.com)

**Certificate of Analysis**

Product Name: Ethylene glycol dimethacrylate - 98%, contains 90-110 ppm monomethyl ether hydroquinone as inhibitor

Product Number: 335661  
Batch Number: SHU99904  
Brand: ALDRICH  
CAS Number: 97-90-5  
MDL Number: MFCD00008590  
Formula: C10H14O4  
Formula Weight: 198.22 g/mol  
Storage Temperature: Store at 2 - 8 °C  
Quality Release Date: 22 MAR 2018


C=CC(=O)OCCOC(=O)C=C

| Test                        | Specification         | Result    |
|-----------------------------|-----------------------|-----------|
| Appearance (Color)          | Colorless             | Colorless |
| Appearance (Form)           | Liquid                | Liquid    |
| <sup>1</sup> H NMR Spectrum | Conforms to Structure | Conforms  |
| Purity (GC)                 | ≥ 97.5 %              | 98.5 %    |
| MEHQ as Inhibitor           | 90 - 110 ppm          | 98 ppm    |

*[Signature]*  
Michael Grady, Manager  
Quality Control  
Sheboygan Falls, WI US

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

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**Gambar V. 9 Certificate Of Analysis EGDMA**

## LAMPIRAN 10 (LANJUTAN)

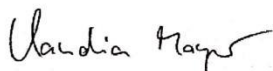
**SIGMA-ALDRICH**

 3050 Spruce Street, Saint Louis, MO 63103 USA  
 Email USA: techserv@sigmaaldrich.com Outside USA: eurtechserv@sigmaaldrich.com

### Certificate of Analysis

**Product Name:** METHACRYLIC ACID  
 Yes MEHQ 250ppm inhibitor, 99 %  
**Product Number:** 155721  
**Batch Number:** STBH9946  
**Brand:** Aldrich  
**CAS Number:** 79-41-4  
**Formula:**  $\text{H}_2\text{C}=\text{C}(\text{CH}_3)\text{COOH}$   
**Formula Weight:** 86.09  
**Quality Release Date:** 12 APR 2019

| TEST                    | SPECIFICATION         | RESULT    |
|-------------------------|-----------------------|-----------|
| STABILIZER              | 200 - 300 PPM MEHQ    | 260 PPM   |
| APPEARANCE (COLOR)      | COLORLESS             | COLORLESS |
| APPEARANCE (FORM)       | LIQUID                | LIQUID    |
| TITRATION (T) NaOH 0.1M | 98.5 - 101.5 %        | 99.8 %    |
| INFRARED SPECTRUM       | CONFORMS TO STRUCTURE | CONFORMS  |
| PROTON NMR SPECTRUM     | CONFORMS TO STRUCTURE | CONFORMS  |



Claudia Mayer  
 Manager Quality Control  
 Steinheim, Germany

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Sigma-Aldrich

Certificate of Analysis - Product 155721 Lot STBH9946

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**Gambar V. 10** Certificate Of Analysis Asam Metakrilat

## LAMPIRAN 10

### (LANJUTAN)



### Certificate of Analysis

1.06009.2500 Methanol for analysis EMSURE® ACS,ISO,Reag. Ph Eur  
Batch I0997709

|                                                   | Spec. Values  |       | Batch Values |       |
|---------------------------------------------------|---------------|-------|--------------|-------|
| Purity (GC)                                       | ≥ 99.9        | %     | 99.9         | %     |
| Identity (IR)                                     | conforms      |       | conforms     |       |
| Appearance                                        | clear         |       | clear        |       |
| Color                                             | ≤ 10          | Hazen | < 5          | Hazen |
| Solubility in water                               | conforms      |       | conforms     |       |
| Acidity                                           | ≤ 0.0002      | meq/g | 0.0001       | meq/g |
| Alkalinity                                        | ≤ 0.0002      | meq/g | < 0.0002     | meq/g |
| Density (d 20 °C/20 °C)                           | 0.791 - 0.793 |       | 0.793        |       |
| Boiling point                                     | 64 - 65       | °C    | 64           | °C    |
| Benzene (impurity A) (GC)                         | ≤ 2           | ppm   | < 1          | ppm   |
| Ethanol (GC)                                      | ≤ 0.05        | %     | < 0.01       | %     |
| Acetone                                           | ≤ 0.001       | %     | ≤ 0.001      | %     |
| Acetaldehyde                                      | ≤ 0.001       | %     | ≤ 0.001      | %     |
| Formaldehyde                                      | ≤ 0.001       | %     | ≤ 0.001      | %     |
| Readily carbonizable substances                   | conforms      |       | conforms     |       |
| Carbonyl compounds (as CO)                        | ≤ 0.001       | %     | ≤ 0.001      | %     |
| Chloride (Cl)                                     | ≤ 0.5         | ppm   | ≤ 0.5        | ppm   |
| Sulfate (SO <sub>4</sub> )                        | ≤ 1           | ppm   | ≤ 1          | ppm   |
| Substances reducing potassium permanganate (as O) | ≤ 0.00025     | %     | ≤ 0.00025    | %     |
| Ag (Silver)                                       | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Al (Aluminium)                                    | ≤ 0.00005     | %     | ≤ 0.00005    | %     |
| As (Arsenic)                                      | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Au (Gold)                                         | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Ba (Barium)                                       | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Be (Beryllium)                                    | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Bi (Bismuth)                                      | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Ca (Calcium)                                      | ≤ 0.00005     | %     | ≤ 0.00005    | %     |
| Cd (Cadmium)                                      | ≤ 0.000005    | %     | ≤ 0.000005   | %     |
| Co (Cobalt)                                       | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Cr (Chromium)                                     | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Cu (Copper)                                       | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Fe (Iron)                                         | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Ga (Gallium)                                      | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| In (Indium)                                       | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Li (Lithium)                                      | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Mg (Magnesium)                                    | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Mn (Manganese)                                    | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Mo (Molybdenum)                                   | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Ni (Nickel)                                       | ≤ 0.000002    | %     | ≤ 0.000002   | %     |
| Pb (Lead)                                         | ≤ 0.00001     | %     | ≤ 0.00001    | %     |
| Pt (Platinum)                                     | ≤ 0.000005    | %     | ≤ 0.000005   | %     |

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Gambar V. 11 Certificate Of Analysis Metanol

## LAMPIRAN 10 (LANJUTAN)

### Certificate of Analysis

1.06009.2500 Methanol for analysis EMSURE® ACS,ISO,Reag. Ph Eur  
Batch I0997709

|                     |            |   |            |   |
|---------------------|------------|---|------------|---|
| Sn (Tin)            | ≤ 0.00001  | % | ≤ 0.00001  | % |
| Ti (Titanium)       | ≤ 0.000002 | % | ≤ 0.000002 | % |
| Tl (Thallium)       | ≤ 0.000002 | % | ≤ 0.000002 | % |
| V (Vanadium)        | ≤ 0.000002 | % | ≤ 0.000002 | % |
| Zn (Zinc)           | ≤ 0.00001  | % | ≤ 0.00001  | % |
| Zr (Zirconium)      | ≤ 0.000002 | % | ≤ 0.000002 | % |
| Evaporation residue | ≤ 0.0005   | % | < 0.0001   | % |
| Water               | ≤ 0.05     | % | 0.01       | % |

ACS, ISO, Reag Ph Eur

Date of release (DD.MM.YYYY) 15.02.2019  
Minimum shelf life (DD.MM.YYYY) 29.02.2024

Jeannette David  
Responsible laboratory manager quality control

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**Gambar V. 12** Certificate Of Analysis Metanol

## LAMPIRAN 10

### (LANJUTAN)



## Certificate of Analysis

1.00063.2500 Acetic acid (glacial) 100% anhydrous for analysis EMSURE® ACS,ISO,  
Reag. Ph Eur  
Batch K52999463

|                              | Spec. Values |       | Batch Values |       |
|------------------------------|--------------|-------|--------------|-------|
| Assay (alkalimetric)         | ≥ 99.8       | %     | 99.9         | %     |
| Identity                     | passes test  |       | passes test  |       |
| Color                        | ≤ 10         | Hazen | < 5          | Hazen |
| Acetaldehyde                 | ≤ 2          | ppm   | < 2          | ppm   |
| Acetic anhydride             | ≤ 100        | ppm   | 90           | ppm   |
| Titrateable base             | ≤ 0.0004     | meq/g | < 0.0004     | meq/g |
| Solidification temperature   | ≥ 16.3       | °C    | 16.4         | °C    |
| Chloride (Cl)                | ≤ 0.4        | ppm   | < 0.2        | ppm   |
| Phosphate (PO <sub>4</sub> ) | ≤ 0.4        | ppm   | < 0.1        | ppm   |
| Heavy metals (as Pb)         | ≤ 0.5        | ppm   | < 0.5        | ppm   |
| Sulfate (SO <sub>4</sub> )   | ≤ 0.4        | ppm   | < 0.4        | ppm   |
| Ag (Silver)                  | ≤ 0.005      | ppm   | < 0.005      | ppm   |
| Al (Aluminium)               | ≤ 0.020      | ppm   | < 0.010      | ppm   |
| As (Arsenic)                 | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Au (Gold)                    | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| B (Boron)                    | ≤ 0.100      | ppm   | < 0.010      | ppm   |
| Ba (Barium)                  | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Be (Beryllium)               | ≤ 0.005      | ppm   | < 0.005      | ppm   |
| Bi (Bismuth)                 | ≤ 0.050      | ppm   | < 0.010      | ppm   |
| Ca (Calcium)                 | ≤ 0.100      | ppm   | < 0.020      | ppm   |
| Cd (Cadmium)                 | ≤ 0.020      | ppm   | < 0.010      | ppm   |
| Co (Cobalt)                  | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Cr (Chromium)                | ≤ 0.020      | ppm   | < 0.010      | ppm   |
| Cu (Copper)                  | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Fe (Iron)                    | ≤ 0.050      | ppm   | < 0.040      | ppm   |
| Ga (Gallium)                 | ≤ 0.050      | ppm   | < 0.010      | ppm   |
| Ge (Germanium)               | ≤ 0.020      | ppm   | < 0.010      | ppm   |
| Hg (Mercury)                 | ≤ 0.005      | ppm   | < 0.005      | ppm   |
| In (Indium)                  | ≤ 0.050      | ppm   | < 0.050      | ppm   |
| K (Potassium)                | ≤ 0.100      | ppm   | < 0.050      | ppm   |
| Li (Lithium)                 | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Mg (Magnesium)               | ≤ 0.050      | ppm   | < 0.010      | ppm   |
| Mn (Manganese)               | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Mo (Molybdenum)              | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Na (Sodium)                  | ≤ 0.200      | ppm   | < 0.010      | ppm   |
| Ni (Nickel)                  | ≤ 0.020      | ppm   | < 0.010      | ppm   |
| Pb (Lead)                    | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Pt (Platinum)                | ≤ 0.100      | ppm   | < 0.050      | ppm   |
| Sn (Tin)                     | ≤ 0.050      | ppm   | < 0.010      | ppm   |
| Sr (Strontium)               | ≤ 0.010      | ppm   | < 0.005      | ppm   |
| Ti (Titanium)                | ≤ 0.050      | ppm   | < 0.010      | ppm   |

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**Gambar V. 13** Certificate Of Analysis Asam Asetat 1

## LAMPIRAN 10 (LANJUTAN)

### Certificate of Analysis

1.00063.2500 Acetic acid (glacial) 100% anhydrous for analysis EMSURE® ACS,ISO,  
Reag. Ph Eur  
Batch K52999463

|                                            |             |     |             |     |
|--------------------------------------------|-------------|-----|-------------|-----|
| Tl (Thallium)                              | ≤ 0.020     | ppm | < 0.010     | ppm |
| V (Vanadium)                               | ≤ 0.010     | ppm | < 0.005     | ppm |
| Zn (Zinc)                                  | ≤ 0.030     | ppm | < 0.010     | ppm |
| Zr (Zirconium)                             | ≤ 0.050     | ppm | < 0.010     | ppm |
| Substances reducing potassium dichromate   | passes test |     | passes test |     |
| Substances reducing potassium permanganate | ≤ 20        | ppm | < 20        | ppm |
| Evaporation residue                        | ≤ 5         | ppm | < 5         | ppm |
| Water                                      | ≤ 0.2       | %   | 0.03        | %   |
| Dilution test                              | passes test |     | passes test |     |
| Minimum shelf life: see product label      |             |     |             |     |

Date of examination (DD.MM.YYYY) 04.01.2021

Dr. Reiner Vogt  
Responsible laboratory manager quality control

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**Gambar V. 14** Certificate Of Analysis Asam Asetat 2

