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## LAMPIRAN

**Lampiran 1:** Pengujian Spektrum UV-Vis

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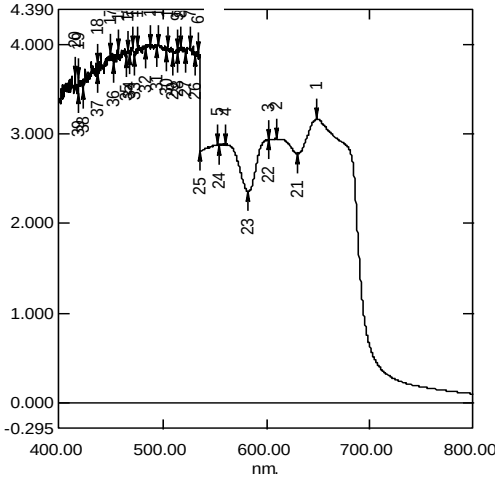


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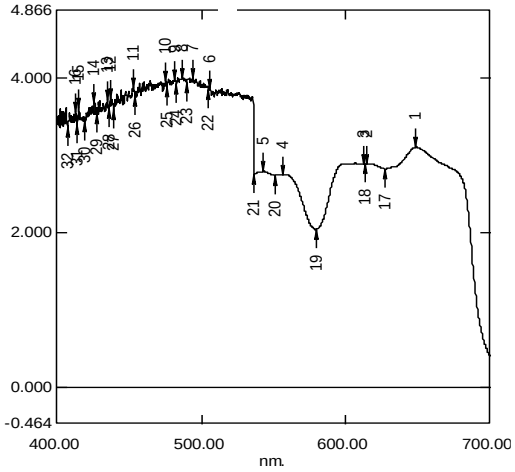
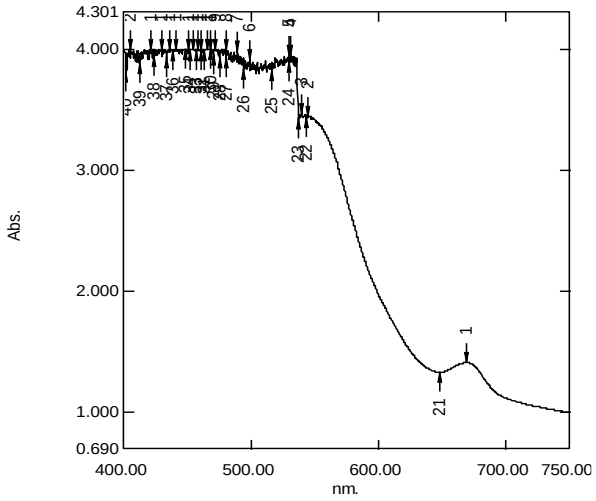
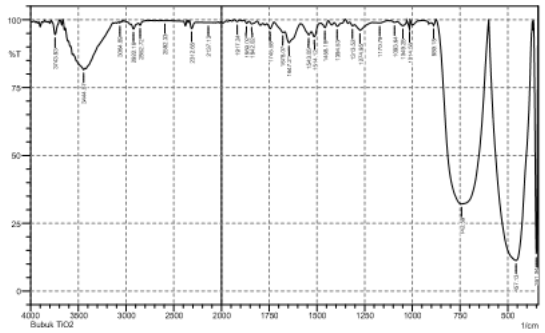



Daun Palili- Etanol



**Lampiran 2:** Pengujian Spektrum FTIR

SHIMADZU




| No. | Peak | Intensity | Corr. Intensity | Base (H) | Base (L) | Area | Corr. Area |
|---|---|---|---|---|---|---|---|
| 1 | 351.04 | 13.662 | 73.597 | 364.55 | 343.33 | 8.469 | 7.338 |
| 2 | 457.13 | 11.317 | 88.207 | 599.86 | 372.26 | 121.326 | 120.989 |
| 3 | 742.59 | 32.147 | 67.292 | 875.68 | 601.79 | 85.328 | 84.63 |
| 4 | 889.18 | 97.869 | 1.837 | 900.76 | 877.61 | 0.129 | 0.08 |
| 5 | 1014.56 | 96.585 | 3.326 | 1029.99 | 1012.63 | 0.127 | 0.119 |
| 6 | 1049.28 | 97.842 | 1.822 | 1089.14 | 1029.99 | 0.333 | 0.246 |
| 7 | 1093.64 | 99.036 | 0.41 | 1114.86 | 1089.14 | 0.106 | 0.027 |
| 8 | 1170.79 | 98.817 | 0.391 | 1193.94 | 1132.21 | 0.241 | 0.053 |
| 9 | 1274.95 | 96.127 | 2.267 | 1301.95 | 1209.37 | 0.962 | 0.383 |
| 10 | 1313.52 | 97.767 | 0.786 | 1328.95 | 1301.95 | 0.205 | 0.042 |
| 11 | 1394.53 | 97.618 | 1.614 | 1408.04 | 1352.1 | 0.341 | 0.229 |
| 12 | 1458.18 | 97.121 | 2.111 | 1477.47 | 1440.83 | 0.292 | 0.165 |
| 13 | 1514.12 | 93.772 | 2.92 | 1529.55 | 1485.19 | 0.796 | 0.239 |
| 14 | 1543.05 | 94.428 | 1.876 | 1587.42 | 1529.55 | 0.931 | 0.186 |
| 15 | 1647.21 | 91.536 | 4.752 | 1666.5 | 1587.42 | 2.002 | 0.985 |
| 16 | 1678.07 | 95.346 | 0.826 | 1724.36 | 1668.43 | 0.759 | 0.097 |
| 17 | 1745.58 | 96.75 | 2.004 | 1762.94 | 1724.36 | 0.365 | 0.16 |
| 18 | 1842.02 | 98.481 | 0.962 | 1856.52 | 1813.06 | 0.199 | 0.1 |
| 19 | 1869.02 | 98.707 | 0.915 | 1882.52 | 1855.52 | 0.092 | 0.047 |
| 20 | 1917.24 | 99.347 | 0.629 | 1930.74 | 1903.74 | 0.041 | 0.038 |
| 21 | 2137.13 | 98.962 | 0.028 | 2152.56 | 2125.56 | 0.12 | 0.002 |
| 22 | 2312.65 | 96.804 | 2.691 | 2337.72 | 2268.29 | 0.542 | 0.361 |
| 23 | 2592.33 | 99.68 | 0.023 | 2632.83 | 2576.9 | 0.074 | 0.003 |
| 24 | 2852.72 | 98.013 | 0.906 | 2872.01 | 2789.07 | 0.345 | 0.054 |
| 25 | 2922.16 | 96.632 | 1.883 | 2951.09 | 2872.01 | 0.751 | 0.25 |
| 26 | 3064.89 | 98.854 | 0.436 | 3082.25 | 3062.96 | 0.084 | 0.017 |
| 27 | 3444.87 | 81.622 | 1.074 | 3554.81 | 3431.36 | 9.439 | 0.51 |
| 28 | 3743.83 | 94.618 | 5.271 | 3786.27 | 3693.68 | 0.938 | 0.898 |

Comment;
Bubuk TiO2

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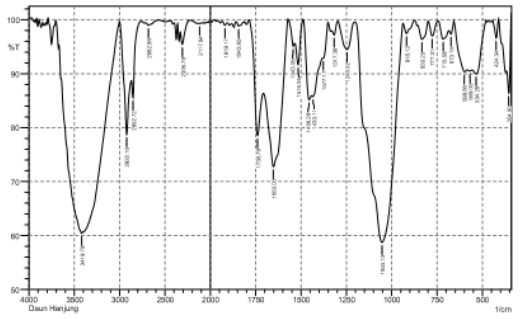
No. of Scans;
Resolution;
Apodization;

SHIMADZU




| No. | Peak | Intensity | Corr. Intensity | Base (H) | Base (L) | Area | Corr. Area |
|---|---|---|---|---|---|---|---|
| 1 | 354.9 | 86.383 | 7.8 | 364.55 | 343.33 | 0.968 | 0.482 |
| 2 | 424.34 | 96.61 | 3.433 | 443.83 | 410.84 | 0.243 | 0.246 |
| 3 | 534.28 | 89.984 | 3.295 | 555.5 | 480.28 | 2.219 | 0.647 |
| 4 | 569 | 90.509 | 0.182 | 582.5 | 557.43 | 1.077 | 0.013 |
| 5 | 599.86 | 90.368 | 2.261 | 655.8 | 584.43 | 2.244 | 0.628 |
| 6 | 673.16 | 97.368 | 1.389 | 684.73 | 657.73 | 0.23 | 0.098 |
| 7 | 715.59 | 96.408 | 2.516 | 744.52 | 684.73 | 0.647 | 0.357 |
| 8 | 777.31 | 96.096 | 2.767 | 798.53 | 744.52 | 0.37 | 0.316 |
| 9 | 833.25 | 96.373 | 2.95 | 858.32 | 798.53 | 0.625 | 0.464 |
| 10 | 918.12 | 97.48 | 2.022 | 937.4 | 873.75 | 0.4 | 0.292 |
| 11 | 1053.13 | 58.715 | 40.691 | 1203.58 | 939.33 | 33.662 | 33 |
| 12 | 1246.02 | 94.496 | 5.167 | 1296.16 | 1205.51 | 1.298 | 1.168 |
| 13 | 1317.38 | 97.192 | 1.463 | 1330.88 | 1296.16 | 0.27 | 0.097 |
| 14 | 1377.17 | 92.86 | 0.907 | 1381.03 | 1352.1 | 0.627 | 0.134 |
| 15 | 1433.11 | 85.768 | 1.067 | 1449.83 | 1382.96 | 2.879 | 0.122 |
| 16 | 1456.26 | 85.174 | 5.954 | 1487.12 | 1442.75 | 2.093 | 0.582 |
| 17 | 1516.05 | 91.674 | 5.529 | 1531.48 | 1489.05 | 0.887 | 0.477 |
| 18 | 1543.05 | 95.103 | 1.225 | 1570.06 | 1537.27 | 0.359 | 0.037 |
| 19 | 1653 | 72.78 | 18.864 | 1705.07 | 1570.06 | 11.782 | 7.599 |
| 20 | 1739.79 | 78.53 | 13.495 | 1786.08 | 1707 | 4.664 | 2.196 |
| 21 | 1843.95 | 98.829 | 0.795 | 1857.45 | 1816.94 | 0.144 | 0.077 |
| 22 | 1919.17 | 98.97 | 0.596 | 1934.6 | 1905.67 | 0.089 | 0.035 |
| 23 | 2117.84 | 99.3 | 0.061 | 2131.34 | 2098.55 | 0.095 | 0.004 |
| 24 | 2308.79 | 95.44 | 2.861 | 2331.94 | 2243.21 | 0.963 | 0.502 |
| 25 | 2682.98 | 98.986 | 0.543 | 2713.84 | 2565.33 | 0.347 | 0.14 |
| 26 | 2852.72 | 95.54 | 4.929 | 2870.08 | 2762.06 | 2.479 | 0.421 |
| 27 | 2922.16 | 78.745 | 14.212 | 3001.24 | 2872.01 | 7.212 | 3.796 |
| 28 | 3419.79 | 60.404 | 2.298 | 3645.46 | 3402.43 | 38.866 | 6.253 |

Comment;
Daun Hanjuang

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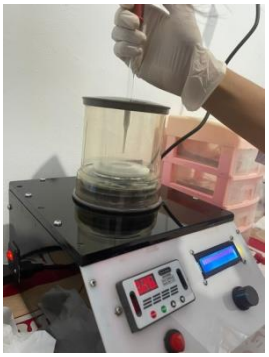
No. of Scans;
Resolution;
Apodization;

**Lampiran 3:** Dokumentasi Penelitian

Mengeringkan daun palili

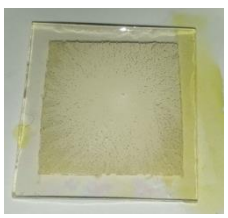
Menghaluskan daun palili

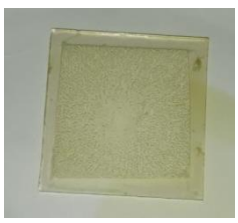
Maserasi *dye* selama 24 jam

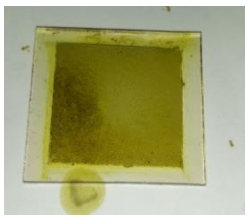


Deposisi pasta $TiO_2$

Perendaman kaca







Hasil perendaman kaca dalam *dye* selama 66 jam

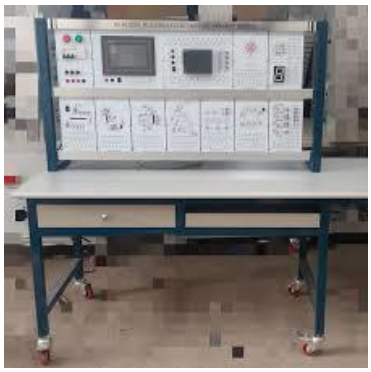
*Counter* elektroda karbon

Fabrikasi DSSC

Uji FTIR

Uji XRD

Multimeter



*Solar Simulator*

**Lampiran 4:** Data Pengujian Arus-Tegangan

Luas area kerja kaca (A) = 4 x $10^{-4}$ $m^2$

$P_{cahaya}$ = 380 W/$m^2$

Daun Palili-Aseton

| **Hambatan (Ω)** | **Tegangan (V)** | **J (mA/cm^2)** | **Arus (µA)** |
|---|---|---|---|
| 1000 | 0.01027 | 0.0026 | 10.27 |
| 900 | 0.0090 | 0.0025 | 10.01 |
| 800 | 0.0080 | 0.0025 | 9.96 |
| 700 | 0.0069 | 0.0025 | 9.86 |
| 600 | 0.0060 | 0.0025 | 9.95 |
| 500 | 0.0050 | 0.0025 | 10.08 |
| 400 | 0.0040 | 0.0025 | 10.10 |
| 300 | 0.0030 | 0.0025 | 10.13 |
| 200 | 0.0020 | 0.0025 | 9.95 |
| 100 | 0.0009 | 0.0023 | 9.30 |
| 50 | 0.0004 | 0.0020 | 8.00 |

Daun Palili-Etanol

| **Hambatan (Ω)** | **Tegangan (V)** | **J (mA/cm^2)** | **Arus (µA)** |
|---|---|---|---|
| 1000 | 0.00515 | 0.0013 | 5.15 |
| 900 | 0.00506 | 0.00141 | 5.62 |
| 800 | 0.00496 | 0.0016 | 6.2 |
| 700 | 0.00488 | 0.0017 | 6.97 |
| 600 | 0.00478 | 0.0020 | 7.97 |
| 500 | 0.00464 | 0.0023 | 9.28 |
| 400 | 0.00442 | 0.0028 | 11.05 |
| 300 | 0.00415 | 0.0035 | 13.83 |
| 200 | 0.00374 | 0.0047 | 18.7 |
| 100 | 0.00271 | 0.0068 | 27.1 |
| 50 | 0.00177 | 0.0089 | 35.4 |

Daun Palili-Asam Asetat

| **Hambatan (Ω)** | **Tegangan (V)** | **J (mA/cm^2)** | **Arus (µA)** |
|---|---|---|---|
| 1000 | 0.00289 | 0.0007 | 2.89 |
| 900 | 0.00272 | 0.0008 | 3.02 |
| 800 | 0.00254 | 0.0008 | 3.18 |
| 700 | 0.0024 | 0.0009 | 3.43 |
| 600 | 0.00221 | 0.0009 | 3.68 |
| 500 | 0.00201 | 0.0010 | 4.02 |
| 400 | 0.0018 | 0.0011 | 4.50 |
| 300 | 0.00147 | 0.0012 | 4.90 |
| 200 | 0.00112 | 0.0014 | 5.60 |
| 100 | 0.00053 | 0.0013 | 5.30 |
| 50 | 0.00024 | 0.0012 | 4.80 |

**Lampiran 5:** Perhitungan Nilai Efisiensi

**a. Efisiensi daun palili-Aseton**

Penyelesaian :

A = 4 x $10^{-4}$ $m^2$

$P_{cahaya}$ = 380 W/ $m^2$

$I_{sc}$ = 10,27 x $10^{-6}$ A

$V_{oc}$ = 0,01027 V

$V_{maks}$ = 0,01027 V

$I_{maks}$ = 10,27 x $10^{-6}$ A

$$J_{sc} = \frac{\text{Isc}}{\text{A}} = \frac{10{,}27 \times 10^{-6}}{4 \times 10^{-4}} = 2{,}57.10^{-2} \text{ A/m}^2$$

$$J_{maks} = \frac{\text{Imaks}}{\text{A}} = \frac{10{,}27 \times 10^{-6}}{4 \times 10^{-4}} = 2{,}57.10^{-2} \text{ A/m}^2$$

$$\text{FF} = \frac{\text{Vmaks Jmaks}}{\text{Voc Jsc}} = \frac{0{,}01027 \text{ V} \times 2{,}57.10^{-2}}{0{,}01027 \text{ V} \times 2{,}57.10^{-2}} = 1$$

Pmaks = Voc × Jsc × FF= (0,01027)(2,57 x $10^{-2}$)(1) = 0,026 x $10^{-2}$ W/ $m^2$

$$\eta = \frac{\text{Pmaks}}{\text{Pcahaya}} = \frac{0{,}026 \times 10^{-2}}{380} = 0{,}68 \text{ x } 10^{-4} \%$$

**b. Efisiensi daun palili-etanol**

Penyelesaian :

A = 4 x $10^{-4}$ $m^2$

$P_{cahaya}$ = 380 W/ $m^2$

$I_{sc}$ = 35,4 x $10^{-6}$ A

$V_{oc}$ = 0,00515 V

$V_{maks}$ = 0,00374 V

$I_{maks}$ = 18,7 x $10^{-6}$ A

$$J_{sc} = \frac{\text{Isc}}{\text{A}} = \frac{35{,}4 \times 10^{-6}}{4 \times 10^{-4}} = 8{,}85.10^{-2} \text{ A/m}^2$$

$J_{maks} = \frac{\text{Imaks}}{\text{A}} = \frac{18{,}7 \times 10^{-6}}{4 \times 10^{-4}} = 4{,}68 .10^{-2}$ A/m$^2$

$\text{FF} = \frac{\text{Vmaks Jmaks}}{\text{Voc Jsc}} = \frac{0{,}00374\ \text{V} \times 4{,}68.10^{-2}}{0{,}00515\ \text{V} \times\ 8{,}85.10^{-2}} = 0{,}38$

Pmaks = Voc × Jsc × FF= (0,00515)(8,85 x $10^{-2}$)(0,38) = 0,0173 x $10^{-2}$ W/ m$^2$

$\eta = \frac{\text{Pmaks}}{\text{Pcahaya}} = \frac{0{,}0173 \times 10^{-2}}{380} = 0{,}45$ x $10^{-5}$ %

**c. Efisiensi daun palili-Asam asetat**

Penyelesaian :

A = 4 x $10^{-4}$ m$^2$

$P_{cahaya}$ = 380 W/ m$^2$

$I_{sc}$ = 5,6 x $10^{-6}$ A

$V_{oc}$ = 0,00289 V

$V_{maks}$ = 0,00221 V

$I_{maks}$ = 3,68 x $10^{-6}$ A

$J_{sc} = \frac{\text{Isc}}{\text{A}} = \frac{5{,}6 \times 10^{-6}}{4 \times 10^{-4}} = 1{,}4. 10^{-2}$ A/m$^2$

$J_{maks} = \frac{\text{Imaks}}{\text{A}} = \frac{3{,}68 \times 10^{-6}}{4 \times 10^{-4}} = 0{,}92 .10^{-2}$ A/m$^2$

$\text{FF} = \frac{\text{Vmaks Jmaks}}{\text{Voc Jsc}} = \frac{0{,}00221\ \text{V} \times 0{,}92.10^{-2}}{0{,}00289\ \text{V} \times\ 1{,}4.10^{-2}} = 0{,}5$

Pmaks = Voc × Jsc × FF= (0,00289)(1,4 x $10^{-2}$)(0,5) = 0,002 x $10^{-2}$ W/ m$^2$

$\eta = \frac{\text{Pmaks}}{\text{Pcahaya}} = \frac{0{,}002 \times 10^{-2}}{380} = 0{,}053$ x $10^{-2}$ % = 0,52 x $10^{-6}$ %

**Lampiran 6:** Tabel Ukuran Kristal Pewarna dan $TiO_2$

Ukuran Kristal $TiO_2$

| 2θ | Intensitas $TiO_2$ | $B_{hkl}$ | hkl | | | Metode Debye Scherer | |
|---|---|---|---|---|---|---|---|
| | | | h | k | l | Ukuran kristal (nm) | Rata-rata ukuran kristal (nm) |
| 25,05 | 7296 | 0,144 | 1 | 0 | 1 | 55,86 | 42,97 |
| 36,67 | 442 | 0,192 | 1 | 0 | 3 | 43,09 | |
| 37,55 | 1267 | 0,168 | 0 | 0 | 4 | 49,37 | |
| 38,38 | 468 | 0,288 | 1 | 2 | 1 | 28,87 | |
| 47,78 | 2619 | 0,192 | 3 | 2 | 1 | 44,73 | |
| 53,65 | 1520 | 0,336 | 1 | 0 | 5 | 26,19 | |
| 54,87 | 1597 | 0,168 | 2 | 1 | 1 | 52,67 | |

Ukuran Kristal $TiO_2$ - Etanol

| 2θ | Intensitas $TiO_2$-Etanol | $B_{hkl}$ | hkl | | | Metode Debye Scherer | |
|---|---|---|---|---|---|---|---|
| | | | h | k | l | Ukuran kristal (nm) | Rata-rata ukuran kristal (nm) |
| 25,44 | 7843 | 0,288 | 1 | 0 | 1 | 27,95 | 37,49 |
| 36,77 | 581 | 0,24 | 1 | 0 | 3 | 34,48 | |
| 37,52 | 2043 | 0,144 | 0 | 0 | 4 | 57,59 | |
| 38,48 | 629 | 0,48 | 1 | 1 | 2 | 17,32 | |
| 47,81 | 3271 | 0,24 | 1 | 0 | 13 | 35,79 | |
| 53,71 | 2218 | 0,24 | 0 | 0 | 6 | 36,67 | |
| 54,83 | 2086 | 0,168 | 1 | 0 | 19 | 52,65 | |

Ukuran Kristal $TiO_2$ – Asam Asetat

| 2θ | Intensitas $TiO_2$-As.Asetat | $B_{hkl}$ | hkl | | | Metode Debye Scherer | |
|---|---|---|---|---|---|---|---|
| | | | h | k | l | Ukuran kristal (nm) | Rata-rata ukuran kristal (nm) |
| 24,98 | 5626 | 0,1968 | 0 | 0 | 4 | 40,87 | 53,51 |
| 36,63 | 474 | 0,236 | 1 | 0 | 3 | 35,05 | |
| 37,48 | 1548 | 0,098 | 1 | 0 | 1 | 84,61 | |

Ukuran Kristal $TiO_2$ – Aseton

| 2θ | Intensitas $TiO_2$-Aseton | $B_{hkl}$ | hkl | | | Metode Debye Scherer | |
|---|---|---|---|---|---|---|---|
| | | | h | k | l | Ukuran kristal (nm) | Rata-rata ukuran kristal (nm) |
| 24,99 | 8624 | 0,24 | 0 | 0 | 4 | 33,51 | 43,19 |
| 36,75 | 456 | 0,192 | 1 | 0 | 3 | 43,09 | |
| 37,44 | 1802 | 0,144 | 0 | 0 | 4 | 57,58 | |
| 38,24 | 515 | 0,24 | 1 | 1 | 2 | 34,63 | |
| 47,69 | 2799 | 0,144 | 2 | 0 | 0 | 59,62 | |
| 54,8 | 1724 | 0,288 | 4 | 1 | 0 | 30,71 | |