

## LAMPIRAN A

### PENENTUAN PERSEN PENURUNAN BERAT KERING, ORDE REAKSI, DAN KONSTANTA LAJU DEGRADASI

#### A.1. Penentuan Prosen Penurunan Berat, Orde Reaksi, dan konstanta laju Degradasi

Apabila berat awal pita PET  $W_0$  dan setelah terdegradasi selama tertentu beratnya menjadi  $W_t$  maka persen penurunan berat keringnya adalah:

$$\% \text{ Penurunan Berat Kering} = \Delta W/W_0 \times 100 \%$$

konstanta laju degradasi untuk orde nol ( $k_0$ ),

$$k_0 = W_0 - W_t / t \times 100 \%$$

konstanta laju degradasi untuk orde satu ( $k_1$ ),

$$k_1 = \ln (W_0/W_t) / t \times 100 \%$$

konstanta laju degradasi untuk orde dua ( $k_2$ ),

$$k_2 = W_0 - W_t / t (W_0) (W_t)$$

Penentuan orde reaksi dilakukan dengan metode coba-coba pada orde nol, satu atau dua yang harga-harga konstanta lajunya memiliki deviasi terendah. Harga-harga berat kering,, penurunan berat kering dan konstanta laju degradasi secara lengkap dapat dilihat pada tabel A.1 sampai A.10.

## A.2. Contoh Perhitungan

Sampel pita PET mula-mula beratnya 210,4 mg, setelah tefotodegradasi selama 70 jam beratnya menjadi 193,275

Persen penurunan berat kering adalah,

$$\% \text{ Penurunan Berat Kering} = 210,4 - 193,275 / 210,4 \times 100 \%$$

$$\% \text{ Penuruna Berat Kering} = 8,14 \%$$

Konstanta laju reaksi orde nol adalah,

$$K_0 = (210,4 - 193,275) / 70$$

$$K_0 = 0,2446 \text{ mg/jam}$$

Konstanta laju reaksi orde satu adalah,

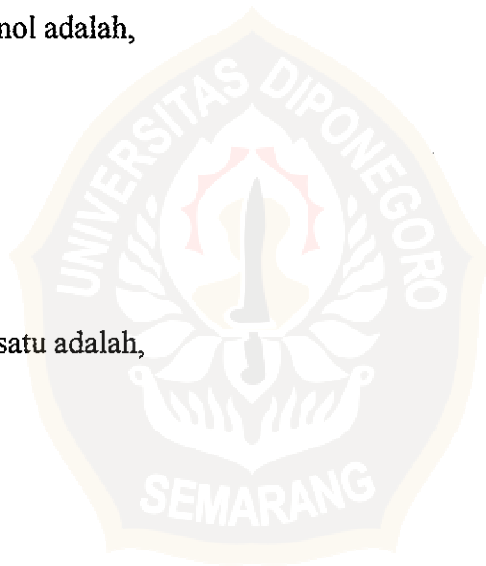
$$K_1 = \ln(210,4 / 193,275) / 70$$

$$K_1 = 1,213 \cdot 10^{-3} \text{ /jam}$$

Konstanta laju reaksi orde dua adalah,

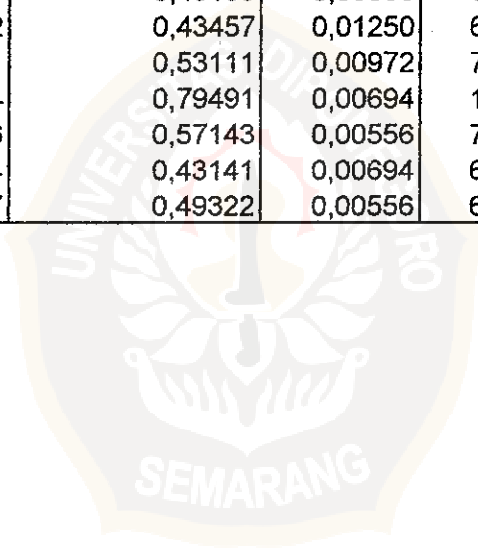
$$K_2 = (210,4 - 193,275) / (70) (210,4) (193,275)$$

$$K_2 = 6 \cdot 10^{-6} \text{ /mg.jam}$$



Tabel A.1 :  
DATA PENURUNAN BERAT KERING  
FILM PET TERFOTODEGRADASI TANPA ADITIF

| No. | t<br>(jam) | Wo<br>(mg) | Wt<br>(mg) | $(W_o - W_t)/W_o \cdot 100\%$<br>(%berat) | $(W_o - W_t) \cdot 1/t$<br>(mg/jam) | $\ln(W_o/W_t) \cdot 1/t$<br>(1/jam) | $(1/W_t - 1/W_o) \cdot 1/t$<br>(1/mg.1/jam) |
|-----|------------|------------|------------|---|-------------------------------------|-------------------------------------|---|
| 1   | 24         | 126,7      | 126,4      | 0,23677                                   | 0,01250                             | 9,878E-05                           | 7,805E-07                                   |
| 2   | 24         | 57,6       | 57,4       | 0,34722                                   | 0,00833                             | 1,449E-04                           | 2,520E-06                                   |
| 3   | 24         | 140,3      | 140        | 0,21383                                   | 0,01250                             | 8,919E-05                           | 6,364E-07                                   |
| 4   | 24         | 60,7       | 60,4       | 0,49423                                   | 0,01250                             | 2,064E-04                           | 3,409E-06                                   |
| 5   | 24         | 96,2       | 96         | 0,20790                                   | 0,00833                             | 8,672E-05                           | 9,023E-07                                   |
| 6   | 24         | 53,3       | 53,2       | 0,18762                                   | 0,00417                             | 7,825E-05                           | 1,469E-06                                   |
| 7   | 24         | 115,6      | 115,5      | 0,08651                                   | 0,00417                             | 3,606E-05                           | 3,121E-07                                   |
| 8   | 24         | 95,9       | 95,5       | 0,41710                                   | 0,01667                             | 1,742E-04                           | 1,820E-06                                   |
| 9   | 48         | 149,9      | 149,7      | 0,13342                                   | 0,00417                             | 2,781E-05                           | 1,857E-07                                   |
| 10  | 48         | 86,2       | 86         | 0,23202                                   | 0,00417                             | 4,839E-05                           | 5,621E-07                                   |
| 11  | 48         | 60         | 59,8       | 0,33333                                   | 0,00417                             | 6,956E-05                           | 1,161E-06                                   |
| 12  | 48         | 92,9       | 92,2       | 0,75350                                   | 0,01458                             | 1,576E-04                           | 1,703E-06                                   |
| 13  | 48         | 102,2      | 101,5      | 0,68493                                   | 0,01458                             | 1,432E-04                           | 1,406E-06                                   |
| 14  | 48         | 77,8       | 77,2       | 0,77121                                   | 0,01250                             | 1,613E-04                           | 2,081E-06                                   |
| 15  | 72         | 98,4       | 98         | 0,40650                                   | 0,00556                             | 5,657E-05                           | 5,761E-07                                   |
| 16  | 72         | 92,7       | 92,3       | 0,43150                                   | 0,00556                             | 6,006E-05                           | 6,493E-07                                   |
| 17  | 72         | 207,1      | 206,2      | 0,43457                                   | 0,01250                             | 6,049E-05                           | 2,927E-07                                   |
| 18  | 72         | 131,8      | 131,1      | 0,53111                                   | 0,00972                             | 7,396E-05                           | 5,627E-07                                   |
| 19  | 72         | 62,9       | 62,4       | 0,79491                                   | 0,00694                             | 1,108E-04                           | 1,769E-06                                   |
| 20  | 72         | 70         | 69,6       | 0,57143                                   | 0,00556                             | 7,959E-05                           | 1,140E-06                                   |
| 21  | 72         | 115,9      | 115,4      | 0,43141                                   | 0,00694                             | 6,005E-05                           | 5,192E-07                                   |
| 22  | 72         | 81,1       | 80,7       | 0,49322                                   | 0,00556                             | 6,867E-05                           | 8,489E-07                                   |

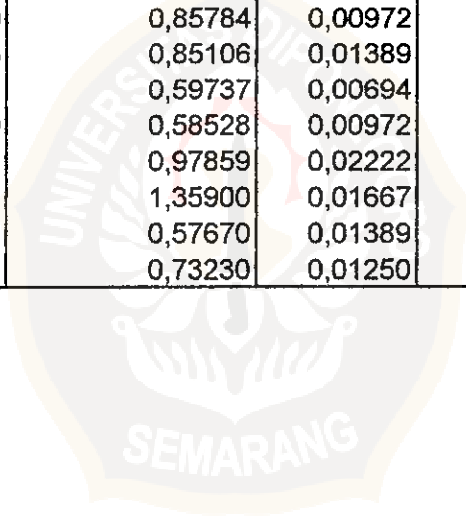


Tabel A.2 :  
 DATA PENURUNAN BERAT KERING  
 FILM PET TERFOTODEGRADASI BERADITIF BENZOFENON

| No. | t<br>(jam) | Wo<br>(mg) | Wt<br>(mg) | $(W_o - W_t) / W_o \cdot 100\%$<br>(%berat) | $(W_o - W_t) \cdot 1/t$<br>(mg/jam) | $\ln(W_o / W_t) \cdot 1/t$<br>(1/jam) | $(1/W_t - 1/W_o) \cdot 1/t$<br>(1/mg.1jam) |
|-----|------------|------------|------------|---|-------------------------------------|---------------------------------------|--|
| 1   | 24         | 154,1      | 153,7      | 0,25957                                     | 0,01667                             | 1,083E-04                             | 7,037E-07                                  |
| 2   | 24         | 58,8       | 58,5       | 0,51020                                     | 0,01250                             | 2,131E-04                             | 3,634E-06                                  |
| 3   | 24         | 57,1       | 56,9       | 0,35026                                     | 0,00833                             | 1,462E-04                             | 2,565E-06                                  |
| 4   | 24         | 108,2      | 107,9      | 0,27726                                     | 0,01250                             | 1,157E-04                             | 1,071E-06                                  |
| 5   | 24         | 90,2       | 89,8       | 0,44346                                     | 0,01667                             | 1,852E-04                             | 2,058E-06                                  |
| 6   | 24         | 102,6      | 102,2      | 0,38986                                     | 0,01667                             | 1,628E-04                             | 1,589E-06                                  |
| 7   | 24         | 110,5      | 110,2      | 0,27149                                     | 0,01250                             | 1,133E-04                             | 1,027E-06                                  |
| 8   | 24         | 185,2      | 184,1      | 0,59395                                     | 0,04583                             | 2,482E-04                             | 1,344E-06                                  |
| 9   | 48         | 56,3       | 55,9       | 0,71048                                     | 0,00833                             | 1,485E-04                             | 2,648E-06                                  |
| 10  | 48         | 73,7       | 73,2       | 0,67843                                     | 0,01042                             | 1,418E-04                             | 1,931E-06                                  |
| 11  | 48         | 109,2      | 108,6      | 0,54945                                     | 0,01250                             | 1,148E-04                             | 1,054E-06                                  |
| 12  | 48         | 178,6      | 177,6      | 0,55991                                     | 0,02083                             | 1,170E-04                             | 6,568E-07                                  |
| 13  | 48         | 81,6       | 81,3       | 0,36765                                     | 0,00625                             | 7,673E-05                             | 9,421E-07                                  |
| 14  | 48         | 127,1      | 126,4      | 0,55075                                     | 0,01458                             | 1,151E-04                             | 9,077E-07                                  |
| 15  | 48         | 98,6       | 98,2       | 0,40568                                     | 0,00833                             | 8,469E-05                             | 8,607E-07                                  |
| 16  | 48         | 140,6      | 140,1      | 0,35562                                     | 0,01042                             | 7,422E-05                             | 5,288E-07                                  |
| 17  | 72         | 135,5      | 134,4      | 0,81181                                     | 0,01528                             | 1,132E-04                             | 8,389E-07                                  |
| 18  | 72         | 153,6      | 152,4      | 0,78125                                     | 0,01667                             | 1,089E-04                             | 7,120E-07                                  |
| 19  | 72         | 69,3       | 68,9       | 0,57720                                     | 0,00556                             | 8,040E-05                             | 1,164E-06                                  |
| 20  | 72         | 78         | 77,6       | 0,51282                                     | 0,00556                             | 7,141E-05                             | 9,178E-07                                  |
| 21  | 72         | 127,6      | 126,7      | 0,70533                                     | 0,01250                             | 9,831E-05                             | 7,732E-07                                  |
| 22  | 72         | 86,1       | 85,4       | 0,81301                                     | 0,00972                             | 1,134E-04                             | 1,322E-06                                  |
| 23  | 72         | 73,7       | 73,2       | 0,67843                                     | 0,00694                             | 9,455E-05                             | 1,287E-06                                  |
| 24  | 72         | 132        | 131,1      | 0,68182                                     | 0,01250                             | 9,502E-05                             | 7,223E-07                                  |
| 25  | 72         | 183,5      | 182,3      | 0,65395                                     | 0,01667                             | 9,112E-05                             | 4,982E-07                                  |
| 26  | 72         | 137,5      | 136,5      | 0,72727                                     | 0,01389                             | 1,014E-04                             | 7,400E-07                                  |

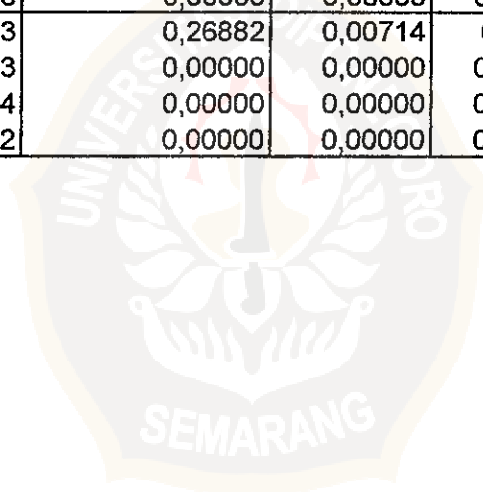
Tabel A.3 :  
DATA PENURUNAN BERAT KERING  
FILM PET TERFOTODEGRADASI BERADITIF NAFTALEN

| No. | t<br>(jam) | Wo<br>(mg) | Wt<br>(mg) | $(W_o - W_t) / W_o \cdot 100\%$<br>(%berat) | $(W_o - W_t) \cdot 1/t$<br>(mg/jam) | $\ln(W_o/W_t) \cdot 1/t$<br>(1/jam) | $(1/W_t - 1/W_o) \cdot 1/t$<br>(1/mg.1/jam) |
|-----|------------|------------|------------|---|-------------------------------------|-------------------------------------|---|
| 1   | 24         | 52,1       | 51,8       | 0,57582                                     | 0,01250                             | 2,406E-04                           | 4,632E-06                                   |
| 2   | 24         | 106,1      | 105,5      | 0,56550                                     | 0,02500                             | 2,363E-04                           | 2,233E-06                                   |
| 3   | 24         | 96,9       | 96,4       | 0,51600                                     | 0,02083                             | 2,156E-04                           | 2,230E-06                                   |
| 4   | 24         | 93,1       | 92,9       | 0,21482                                     | 0,00833                             | 8,961E-05                           | 9,635E-07                                   |
| 5   | 24         | 105,4      | 104,3      | 1,04364                                     | 0,04583                             | 4,371E-04                           | 4,169E-06                                   |
| 6   | 24         | 105        | 104,8      | 0,19048                                     | 0,00833                             | 7,944E-05                           | 7,573E-07                                   |
| 7   | 24         | 158,1      | 157,5      | 0,37951                                     | 0,02500                             | 1,584E-04                           | 1,004E-06                                   |
| 8   | 48         | 100,8      | 100,1      | 0,69444                                     | 0,01458                             | 1,452E-04                           | 1,445E-06                                   |
| 9   | 48         | 83,5       | 83,1       | 0,47904                                     | 0,00833                             | 1,000E-04                           | 1,201E-06                                   |
| 10  | 48         | 104,2      | 103,5      | 0,67179                                     | 0,01458                             | 1,404E-04                           | 1,352E-06                                   |
| 11  | 48         | 99,7       | 99,1       | 0,60181                                     | 0,01250                             | 1,258E-04                           | 1,265E-06                                   |
| 12  | 48         | 72,5       | 72,2       | 0,41379                                     | 0,00625                             | 8,639E-05                           | 1,194E-06                                   |
| 13  | 48         | 96,3       | 95,9       | 0,41537                                     | 0,00833                             | 8,672E-05                           | 9,023E-07                                   |
| 14  | 48         | 69,3       | 68,9       | 0,57720                                     | 0,00833                             | 1,206E-04                           | 1,745E-06                                   |
| 15  | 48         | 114,3      | 113,4      | 0,78740                                     | 0,01875                             | 1,647E-04                           | 1,447E-06                                   |
| 16  | 72         | 79,3       | 78,6       | 0,88272                                     | 0,00972                             | 1,231E-04                           | 1,560E-06                                   |
| 17  | 72         | 124,4      | 123,7      | 0,56270                                     | 0,00972                             | 7,837E-05                           | 6,318E-07                                   |
| 18  | 72         | 81,6       | 80,9       | 0,85784                                     | 0,00972                             | 1,197E-04                           | 1,473E-06                                   |
| 19  | 72         | 117,5      | 116,5      | 0,85106                                     | 0,01389                             | 1,187E-04                           | 1,015E-06                                   |
| 20  | 72         | 83,7       | 83,2       | 0,59737                                     | 0,00694                             | 8,322E-05                           | 9,972E-07                                   |
| 21  | 72         | 119,6      | 118,9      | 0,58528                                     | 0,00972                             | 8,153E-05                           | 6,837E-07                                   |
| 22  | 72         | 163,5      | 161,9      | 0,97859                                     | 0,02222                             | 1,366E-04                           | 8,395E-07                                   |
| 23  | 72         | 88,3       | 87,1       | 1,35900                                     | 0,01667                             | 1,900E-04                           | 2,167E-06                                   |
| 24  | 72         | 173,4      | 172,4      | 0,57670                                     | 0,01389                             | 8,033E-05                           | 4,646E-07                                   |
| 25  | 72         | 122,9      | 122        | 0,73230                                     | 0,01250                             | 1,021E-04                           | 8,337E-07                                   |



Tabel A.4 :  
DATA PENURUNAN BERAT KERING  
FILM PET TERBIODEGRADASI TANPA ADITIF

| No. | t<br>(hari) | Wo<br>(mg) | Wt<br>(mg) | $(W_o - W_t)/W_o \cdot 100\%$<br>(%berat) | $(W_o - W_t) \cdot 1/t$<br>(mg/hari) | $\ln(W_o/W_t) \cdot 1/t$<br>(1/hari) | $(1/W_t - 1/W_o) \cdot 1/t$<br>(1/mg.1/hari) |
|-----|-------------|------------|------------|---|--------------------------------------|--------------------------------------|--|
| 1   | 21          | 119,8      | 119,6      | 0,16694                                   | 0,00952                              | 7,956E-05                            | 6,647E-07                                    |
| 2   | 21          | 109,7      | 109,6      | 0,09116                                   | 0,00476                              | 4,343E-05                            | 3,961E-07                                    |
| 3   | 21          | 82,4       | 82,1       | 0,36408                                   | 0,01429                              | 1,737E-04                            | 2,112E-06                                    |
| 4   | 21          | 90,3       | 90,3       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 5   | 21          | 116,5      | 116,5      | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 6   | 21          | 78,7       | 78,7       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 7   | 21          | 59,5       | 59,5       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 8   | 28          | 106,9      | 106,7      | 0,18709                                   | 0,00714                              | 6,688E-05                            | 6,262E-07                                    |
| 9   | 28          | 80,1       | 79,9       | 0,24969                                   | 0,00714                              | 8,929E-05                            | 1,116E-06                                    |
| 10  | 28          | 67,6       | 67,4       | 0,29586                                   | 0,00714                              | 1,058E-04                            | 1,568E-06                                    |
| 11  | 28          | 53,4       | 53,3       | 0,18727                                   | 0,00357                              | 6,694E-05                            | 1,255E-06                                    |
| 12  | 28          | 93,9       | 93,9       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 13  | 28          | 116,3      | 116,3      | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 14  | 28          | 75,8       | 75,8       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 15  | 35          | 104,1      | 103,9      | 0,19212                                   | 0,00571                              | 5,495E-05                            | 5,283E-07                                    |
| 16  | 35          | 106,8      | 106,3      | 0,46816                                   | 0,01429                              | 1,341E-04                            | 1,258E-06                                    |
| 17  | 35          | 82,7       | 82,7       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 18  | 35          | 81,8       | 81,8       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 19  | 42          | 111,6      | 111,3      | 0,26882                                   | 0,00714                              | 6,409E-05                            | 5,751E-07                                    |
| 20  | 42          | 111,3      | 111,3      | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 21  | 42          | 56,4       | 56,4       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |
| 22  | 42          | 60,2       | 60,2       | 0,00000                                   | 0,00000                              | 0,000E+00                            | 0,000E+00                                    |



Tabel A.5 :  
DATA PENURUNAN BERAT KERING  
FILM PET TERBIODEGRADASI DENGAN ADITIF KITIN

| No. | t<br>(hari) | Wo<br>(mg) | Wt<br>(mg) | $(W_o - W_t)/W_o \cdot 100\%$<br>(%berat) | $(W_o - W_t) \cdot 1/t$<br>(mg/hari) | $\ln(W_o/W_t) \cdot 1/t$<br>(1/hari) | $(1/W_t - 1/W_o) \cdot 1/t$<br>(1/mg.1/hari) |
|-----|-------------|------------|------------|---|--------------------------------------|--------------------------------------|--|
| 1   | 21          | 104,4      | 104,1      | 0,28736                                   | 0,01429                              | 1,370E-04                            | 1,314E-06                                    |
| 2   | 21          | 110,4      | 110,2      | 0,18116                                   | 0,00952                              | 8,634E-05                            | 7,828E-07                                    |
| 3   | 21          | 98,7       | 98,6       | 0,10132                                   | 0,00476                              | 4,827E-05                            | 4,893E-07                                    |
| 4   | 21          | 110,9      | 110,6      | 0,27051                                   | 0,01429                              | 1,290E-04                            | 1,165E-06                                    |
| 5   | 21          | 104,6      | 104,3      | 0,28681                                   | 0,01429                              | 1,368E-04                            | 1,309E-06                                    |
| 6   | 28          | 90,7       | 90,6       | 0,11025                                   | 0,00357                              | 3,940E-05                            | 4,346E-07                                    |
| 7   | 28          | 96,6       | 96,5       | 0,10352                                   | 0,00357                              | 3,699E-05                            | 3,831E-07                                    |
| 8   | 28          | 79         | 78,7       | 0,37975                                   | 0,01071                              | 1,359E-04                            | 1,723E-06                                    |
| 9   | 28          | 69,4       | 69         | 0,57637                                   | 0,01429                              | 2,064E-04                            | 2,983E-06                                    |
| 10  | 28          | 175,8      | 175,3      | 0,28441                                   | 0,01786                              | 1,017E-04                            | 5,794E-07                                    |
| 11  | 35          | 150,8      | 150,2      | 0,39788                                   | 0,01714                              | 1,139E-04                            | 7,569E-07                                    |
| 12  | 35          | 136        | 135,6      | 0,29412                                   | 0,01143                              | 8,416E-05                            | 6,197E-07                                    |
| 13  | 35          | 142,4      | 141,5      | 0,63202                                   | 0,02571                              | 1,812E-04                            | 1,276E-06                                    |
| 14  | 35          | 130,2      | 129,6      | 0,46083                                   | 0,01714                              | 1,320E-04                            | 1,016E-06                                    |
| 15  | 42          | 114,7      | 114        | 0,61029                                   | 0,01667                              | 1,458E-04                            | 1,275E-06                                    |
| 16  | 42          | 168,5      | 168,1      | 0,23739                                   | 0,00952                              | 5,659E-05                            | 3,362E-07                                    |
| 17  | 42          | 113,4      | 113,1      | 0,26455                                   | 0,00714                              | 6,307E-05                            | 5,569E-07                                    |
| 18  | 42          | 157,7      | 157,1      | 0,38047                                   | 0,01429                              | 9,076E-05                            | 5,766E-07                                    |



**Tabel A.6 :**  
**DATA % BERAT KERING DAN KONSTANTA LAJU RATA-RATA**  
**FILM PET TERFOTODEGRADASI TANPA ADITIF**

| t<br>(jam) | Rata-rata<br>$(W_0 - W_t)/W_0$ | Rata-rata<br>$(W_0 - W_t).1/t$ | Rata-rata<br>$\ln(W_0/W_t).1/t$ | Rata-rata<br>$(1/W_t - 1/W_0).1/t$ |
|------------|--------------------------------|--------------------------------|---------------------------------|------------------------------------|
| 0          | 0.000000                       |                                |                                 |                                    |
| 24         | 0.273898                       | 0.010714                       | 0.0001143                       | 1.481E-06                          |
| 48         | 0.484735                       | 0.009028                       | 0.0001013                       | 1.183E-06                          |
| 72         | 0.523320                       | 0.007293                       | 0.0000713                       | 7.940E-07                          |
|            | Deviasi                        | 0.001711                       | 0.0000221                       | 3.445E-07                          |

**Tabel A.7 :**  
**DATA % BERAT KERING DAN KONSTANTA LAJU RATA-RATA**  
**FILM PET TERFOTODEGRADASI DENGAN ADITIF BENZOFENON**

| t<br>(jam) | Rata-rata<br>$(W_0 - W_t)/W_0$ | Rata-rata<br>$(W_0 - W_t).1/t$ | Rata-rata<br>$\ln(W_0/W_t).1/t$ | Rata-rata<br>$(1/W_t - 1/W_0).1/t$ |
|------------|--------------------------------|--------------------------------|---------------------------------|------------------------------------|
| 0          | 0.000000                       |                                |                                 |                                    |
| 24         | 0.399192                       | 0.018229                       | 0.000167                        | 1.799E-06                          |
| 48         | 0.522245                       | 0.011458                       | 0.000109                        | 1.191E-06                          |
| 72         | 0.679626                       | 0.011529                       | 0.000185                        | 8.960E-07                          |
|            | Deviasi                        | 0.003888                       | 0.0000397                       | 4.604E-07                          |

**Tabel A.8 :**  
**DATA % BERAT KERING DAN KONSTANTA LAJU RATA-RATA**  
**FILM PET TERFOTODEGRADASI DENGAN ADITIF NAFTALEN**

| t<br>(jam) | Rata-rata<br>$(W_0 - W_t)/W_0$ | Rata-rata<br>$(W_0 - W_t).1/t$ | Rata-rata<br>$\ln(W_0/W_t).1/t$ | Rata-rata<br>$(1/W_t - 1/W_0).1/t$ |
|------------|--------------------------------|--------------------------------|---------------------------------|------------------------------------|
| 0          | 0.000000                       |                                |                                 |                                    |
| 24         | 0.497967                       | 0.020831                       | 0.000208                        | 2.284E-06                          |
| 48         | 0.580105                       | 0.011456                       | 0.000121                        | 1.318E-06                          |
| 72         | 0.798358                       | 0.012499                       | 0.000111                        | 1.066E-06                          |
|            | Deviasi                        | 0.005138                       | 0.0000532                       | 6.429E-07                          |



**Tabel A.9 :**  
**DATA % BERAT KERING DAN KONSTANTA LAJU RATA-RATA**  
**FILM PET TERBIODEGRADSI TANPA ADITIF KITIN**

| t<br>(hari) | Rata-rata<br>$(W_0 - W_t)/W_0$ | Rata-rata<br>$(W_0 - W_t) \cdot 1/t$ | Rata-rata<br>$\ln(W_0/W_t) \cdot 1/t$ | Rata-rata<br>$(1/W_t - 1/W_0) \cdot 1/t$ |
|-------------|--------------------------------|--------------------------------------|---------------------------------------|--|
| 0           | 0.000000                       |                                      |                                       |  |
| 21          | 0.088883                       | 0.004081                             | 4.238E-05                             | 4.53E-07                                 |
| 28          | 0.131416                       | 0.003570                             | 4.698E-05                             | 6.52E-07                                 |
| 35          | 0.165071                       | 0.005000                             | 4.726E-05                             | 4.46E-07                                 |
| 42          | 0.067204                       | 0.001785                             | 1.062E-05                             | 1.43E-07                                 |
|             | Deviasi                        | 0.001252                             | 0.0000149                             | 2.096E-07                                |

**Tabel A.10 :**  
**DATA % BERAT KERING DAN KONSTANTA LAJU RATA-RATA**  
**FILM PET TERBIODEGRADSI DENGAN ADITIF KITIN**

| t<br>(hari) | Rata-rata<br>$(W_0 - W_t)/W_0$ | Rata-rata<br>$(W_0 - W_t) \cdot 1/t$ | Rata-rata<br>$\ln(W_0/W_t) \cdot 1/t$ | Rata-rata<br>$(1/W_t - 1/W_0) \cdot 1/t$ |
|-------------|--------------------------------|--------------------------------------|---------------------------------------|--|
| 0           | 0.000000                       |                                      |                                       |  |
| 21          | 0.225431                       | 0.011428                             | 0.000107                              | 1.012E-06                                |
| 28          | 0.290860                       | 0.010000                             | 0.000104                              | 1.220E-06                                |
| 35          | 0.446211                       | 0.017855                             | 0.000128                              | 9.170E-07                                |
| 42          | 0.373175                       | 0.011905                             | 0.000089                              | 6.860E-07                                |
|             | Deviasi                        | 0.003467                             | 0.000016                              | 2.215E-07                                |

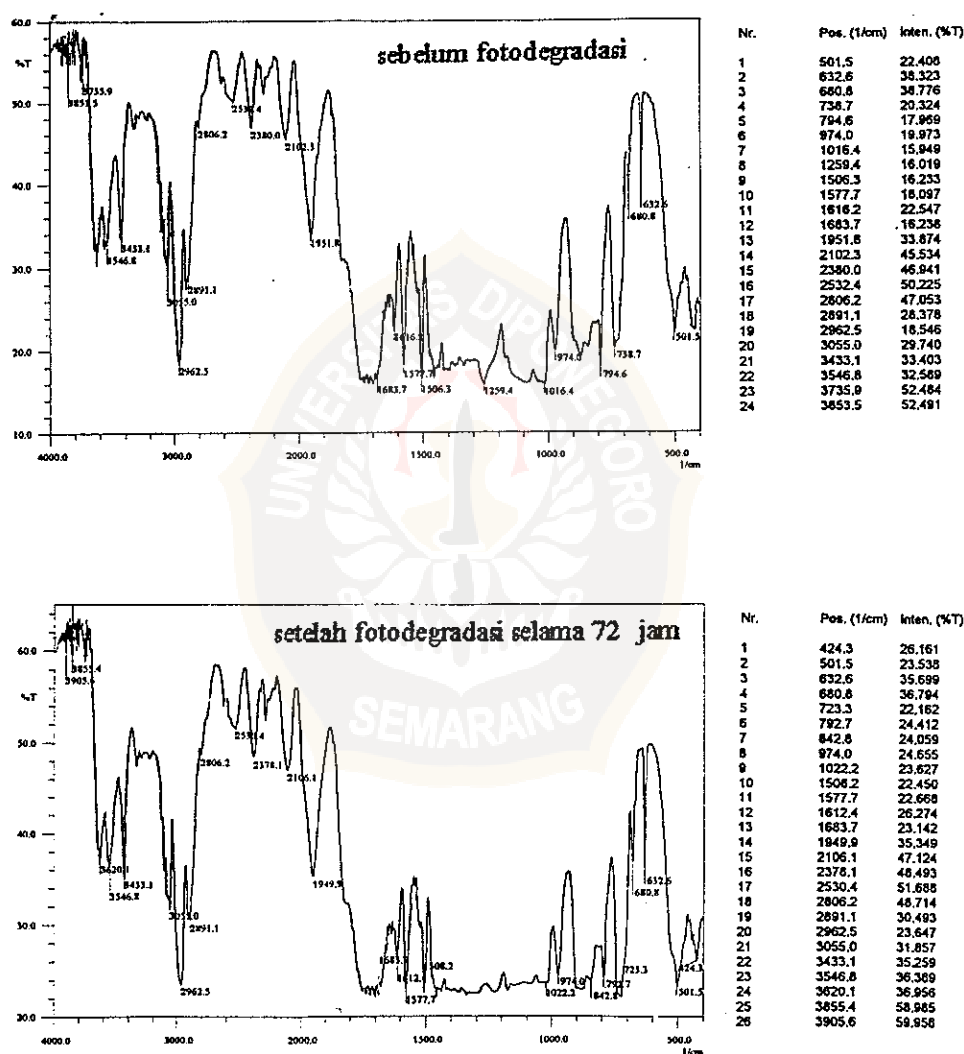
Keterangan :

- t : lama degradasi (fotodegradasi / biodegradasi)  
 $W_0$  : berat sebelum degradasi (mg)  
 $W_t$  : berat setelah degradasi (mg)  
 $(W_0 - W_t)/W_0 \cdot 100\%$  : persen penurunan berat (mg)  
 $(W_0 - W_t) \cdot 1/t$  : konstanta laju orde nol  
 $\ln(W_0/W_t) \cdot 1/t$  : konstanta laju orde satu  
 $(1/W_t - 1/W_0) \cdot 1/t$  : konstanta laju orde dua

## LAMPIRAN B

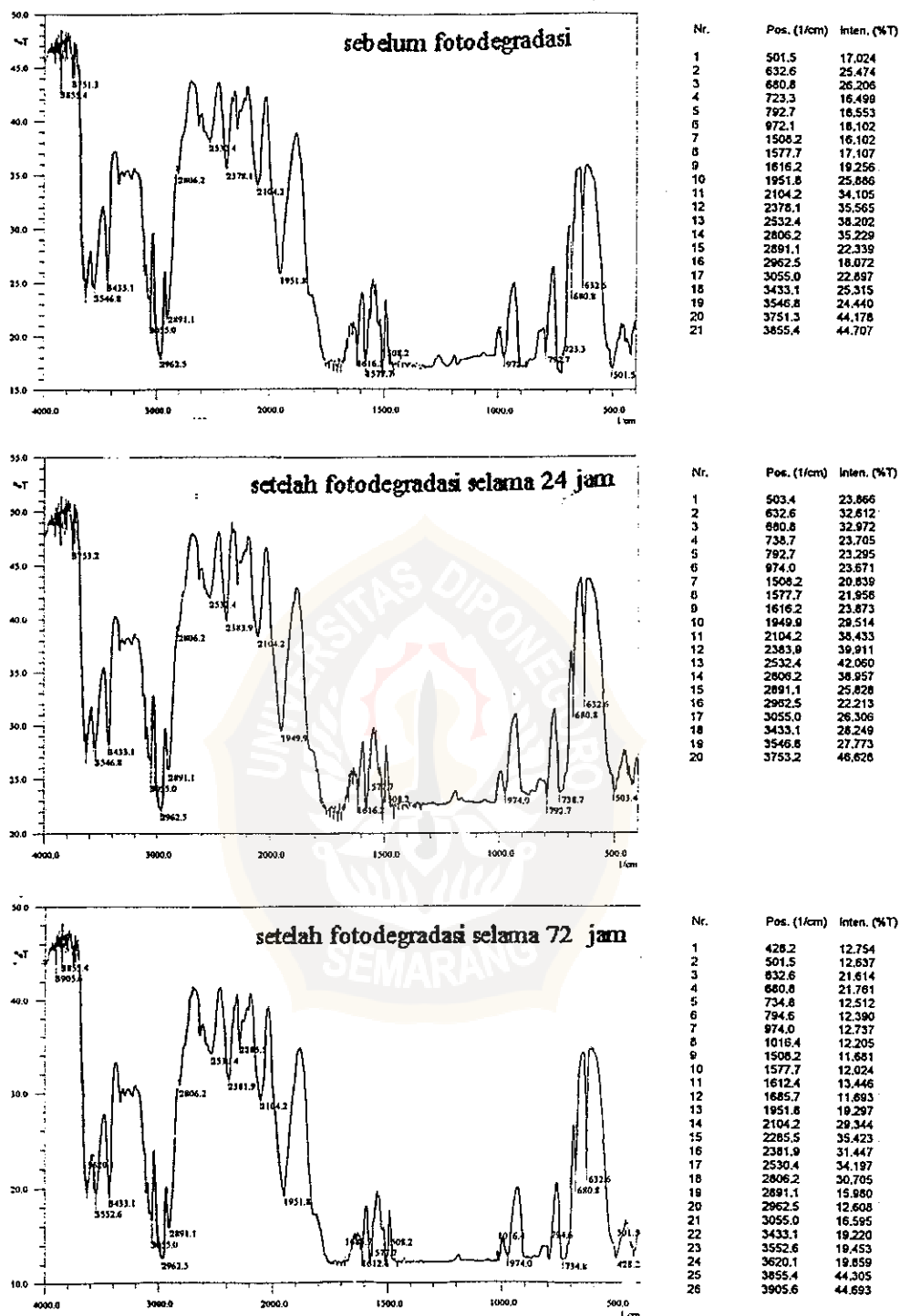
### DATA-DATA SPEKTRA FTIR DAN UV

#### B.1. Spektra FTIR PET Tanpa Aditif Sebelum dan Setelah Fotodegradasi



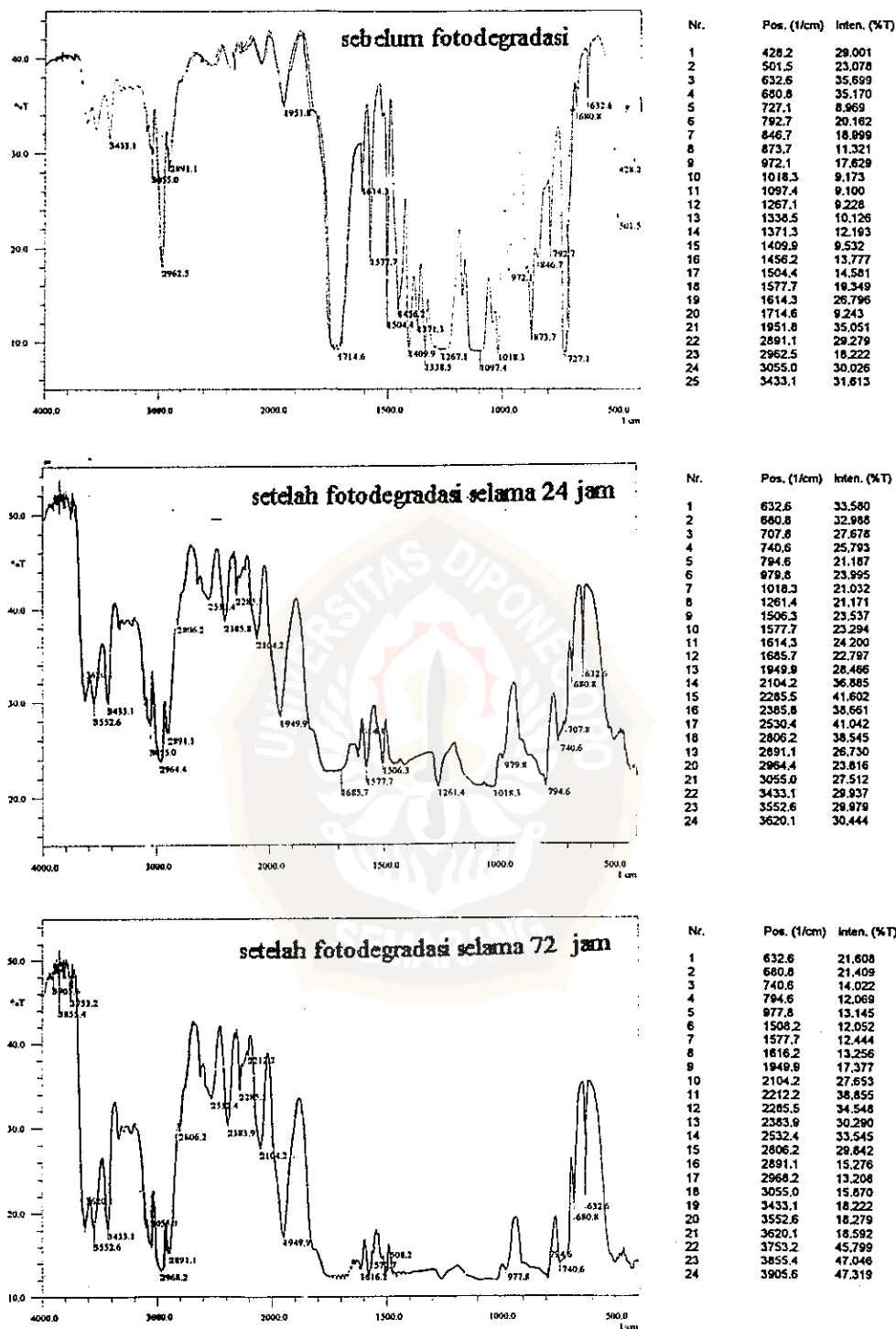
Gambar B.1. Spektra FTIR PET tanpa aditif sebelum dan setelah fotodegradasi

## B.2. Spektra FTIR PET beraditif benzofenon sebelum dan setelah fotodegradasi



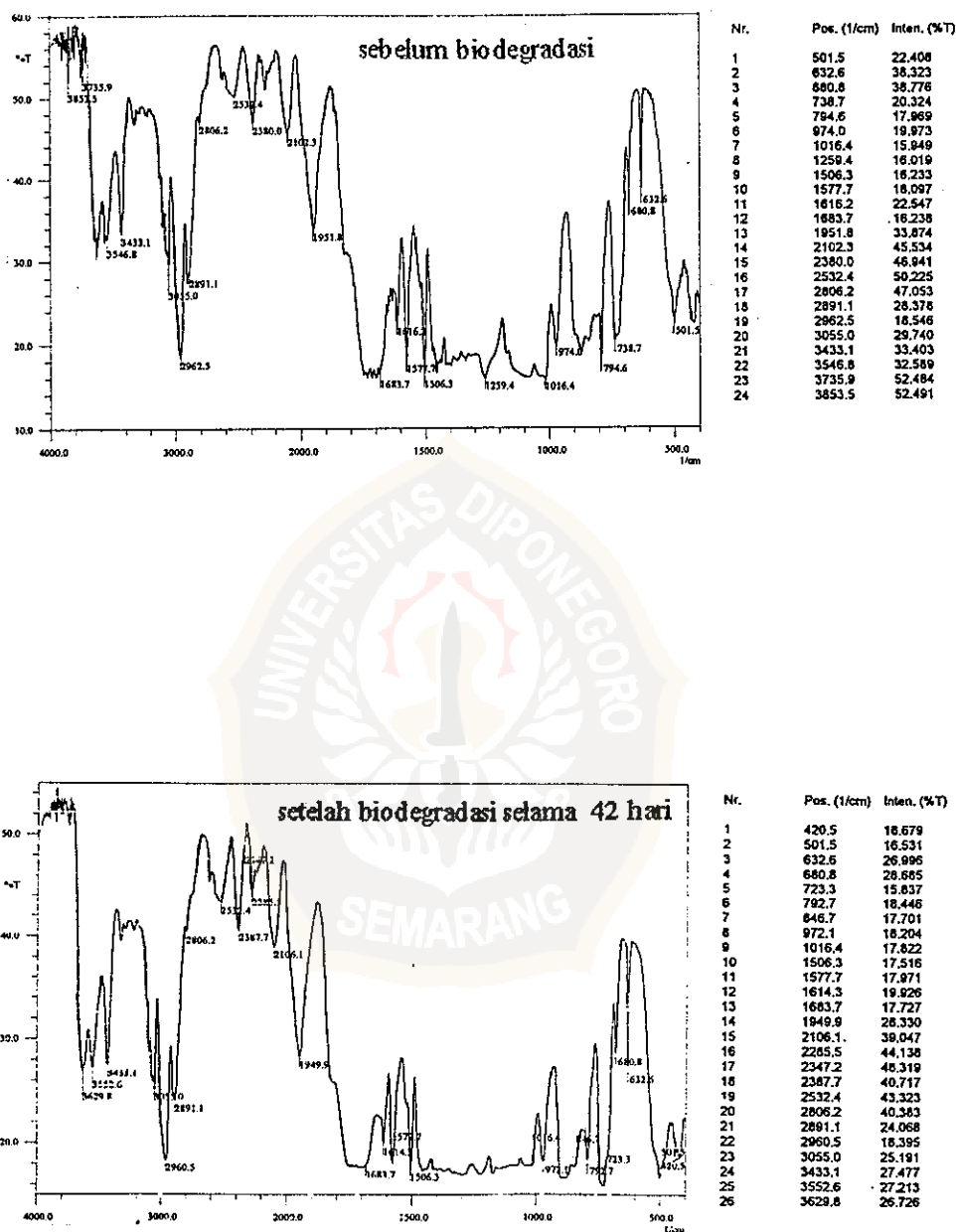
Gambar B.2. Spektra FTIR PET beraditif benzofenon sebelum dan setelah fotodegradasi

### B.3. Spektra FTIR PET Beraditif Naftalen Sebelum dan Setelah Fotodegradasi



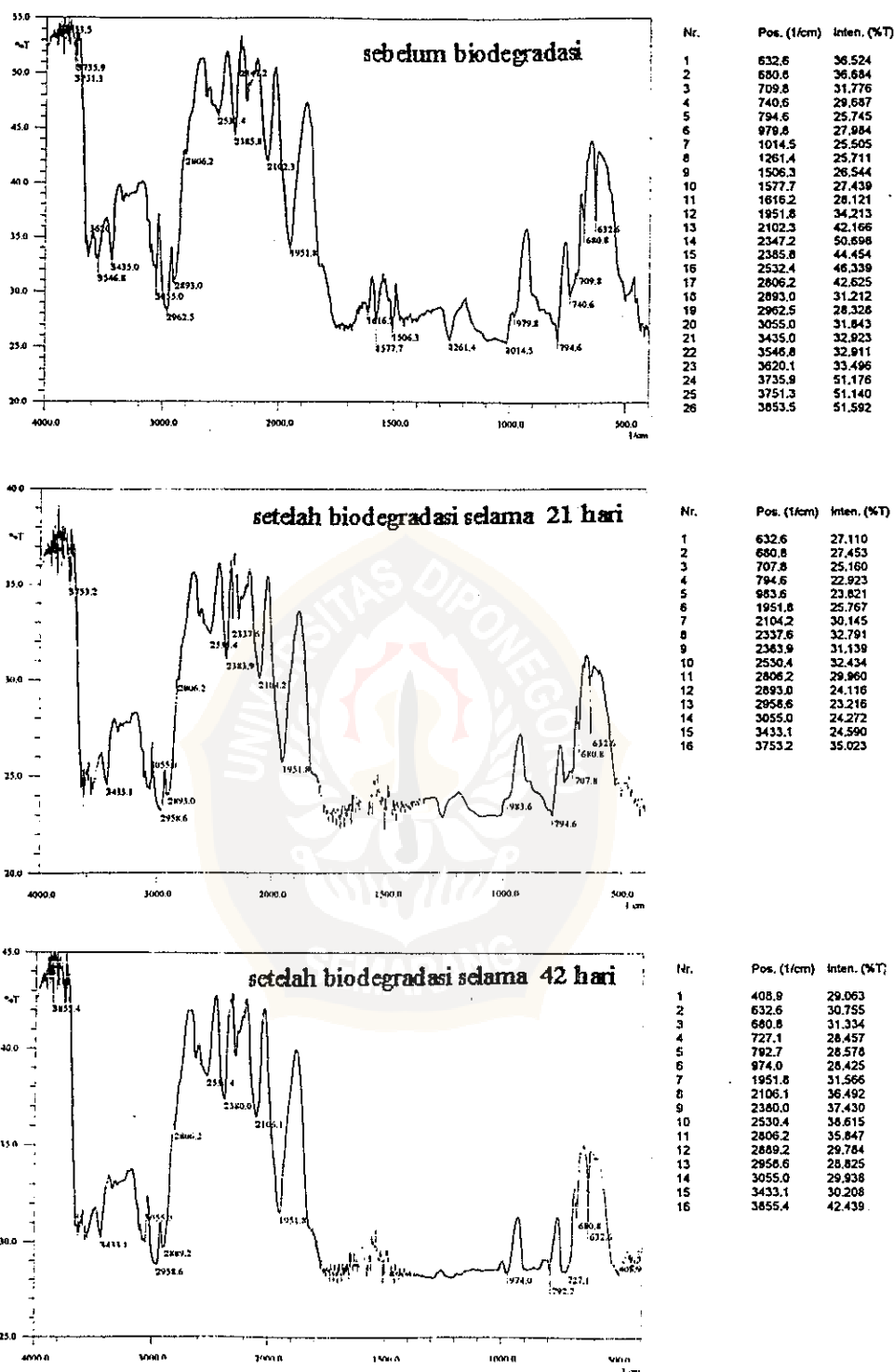
Gambar B.3. Spektra FTIR PET beraditif naftalen sebelum dan setelah fotodegradasi

#### B.4. Spektra FTIR PET Tanpa Aditif Sebelum dan Setelah Biodegradasi



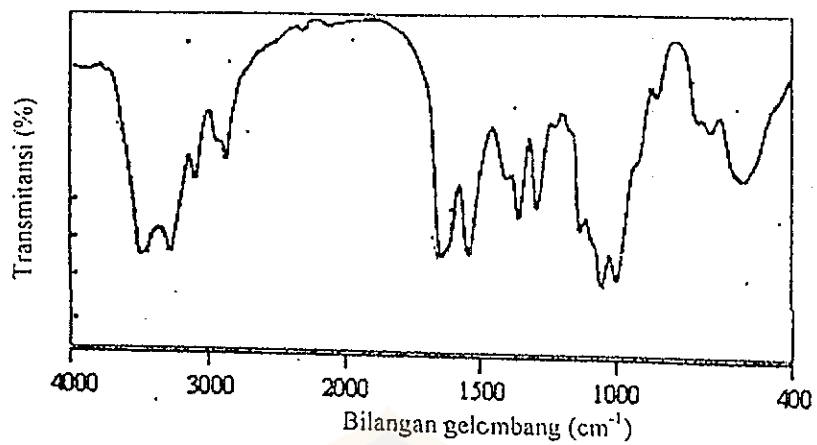
Gambar B.4. Spektra FTIR PET tanpa aditif sebelum dan setelah biodegradasi

### B.5. Spektra FTIR PET Beraditif Kitin Sebelum dan Setelah Biodegradasi

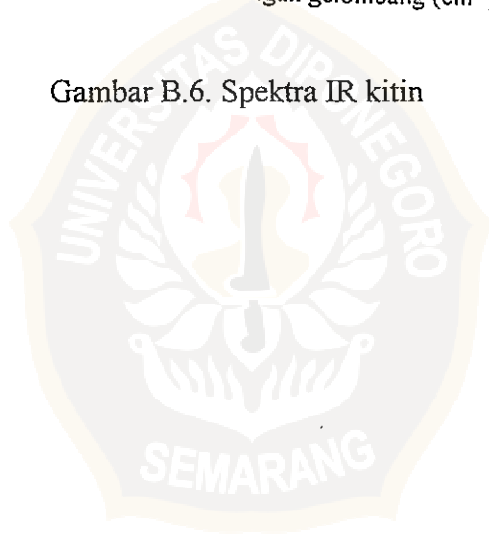


Gambar B.5. Spektra FTIR PET beraditif kitin sebelum dan setelah biodegradasi

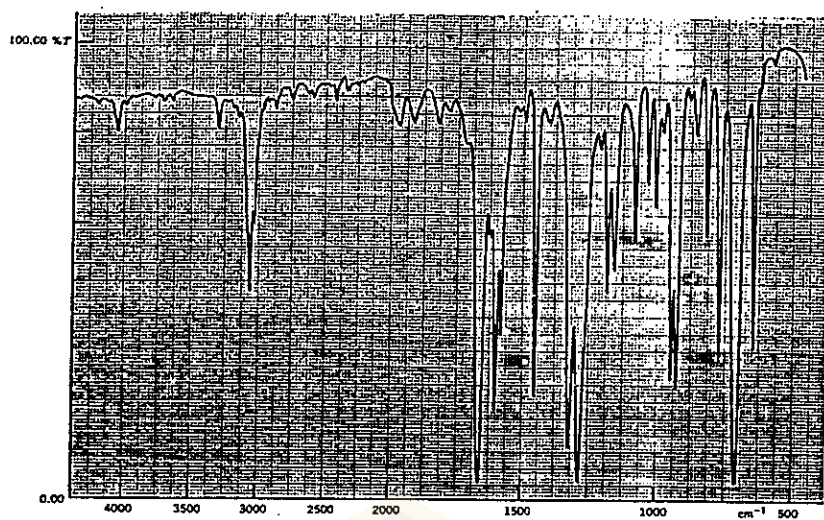
### B.6. Spektra IR Kitin



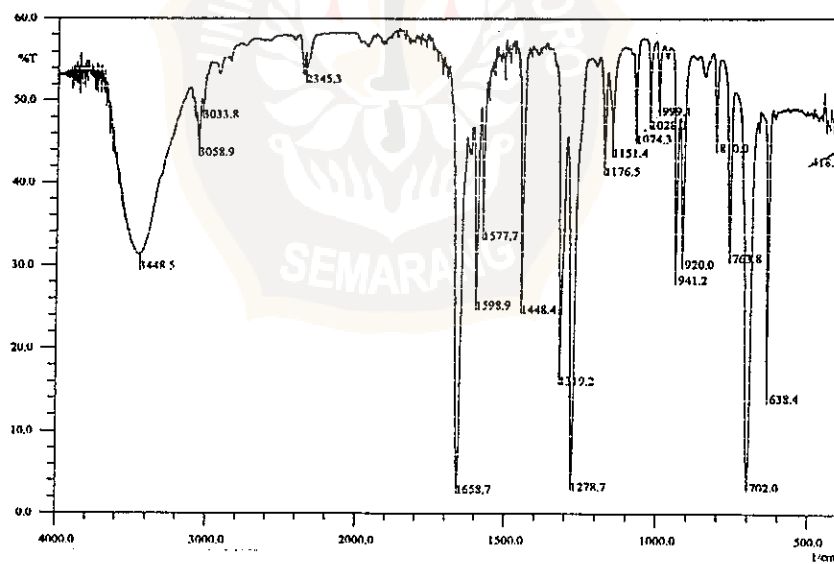
Gambar B.6. Spektra IR kitin



### B.7. Spektra FTIR Benzofenon Sebelum dan Setelah Pelelehan



sebelum pelelehan

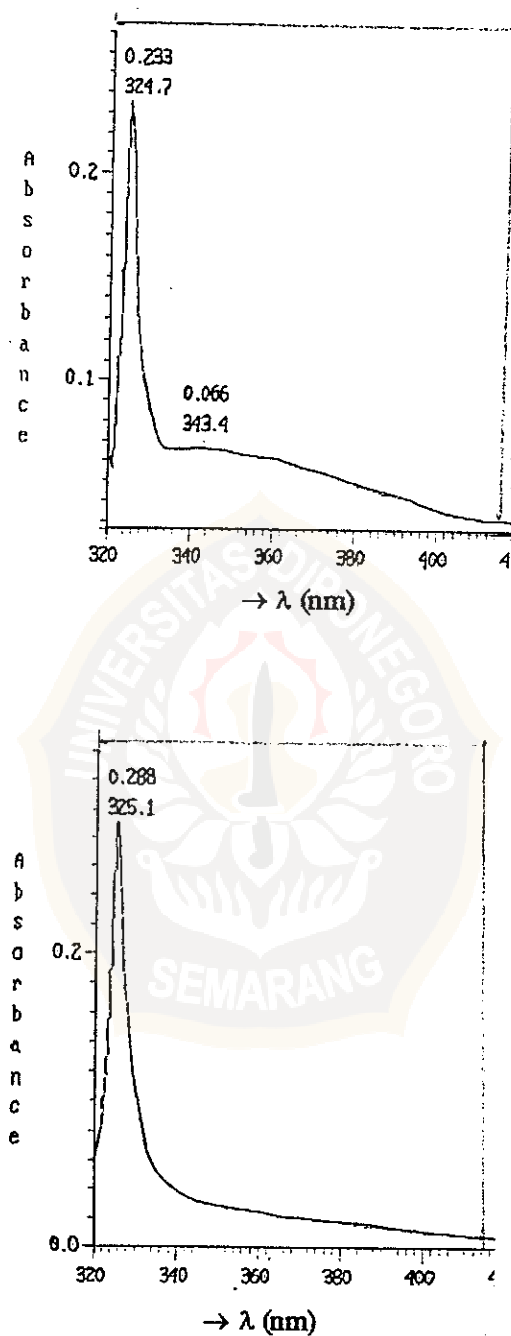


setelah pelelehan pada 256<sup>o</sup> C

Gambar B.7. Spektra FTIR benzofenon sebelum dan setelah pelelehan

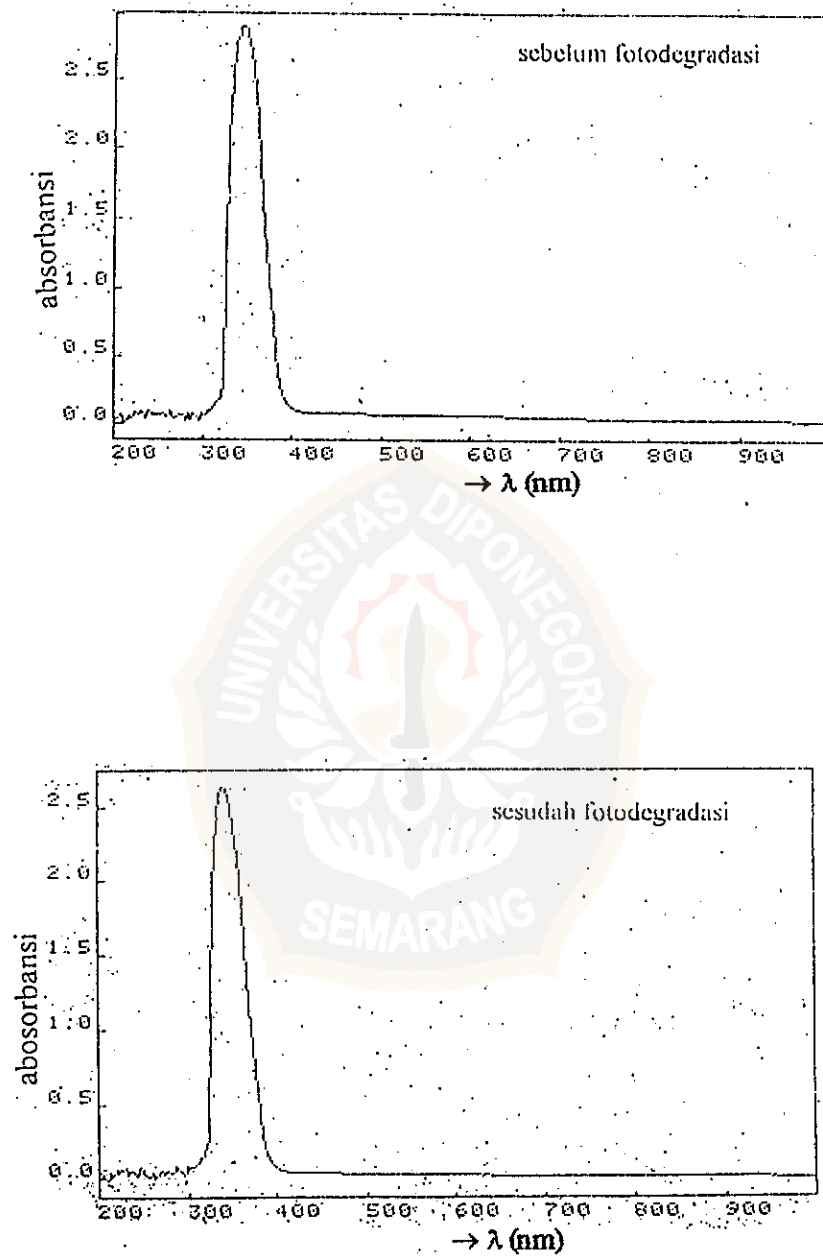


### B.8. Spektra UV Naftalen Sebelum dan Setelah Fotodegradasi



Gambar B.8. Spektra UV naftalen sebelum dan setelah fotodegradasi

### B.9. Spektra UV Benzofenon Sebelum dan Setelah Fotodegradasi



Gambar B.9. Spektra UV benzofenon sebelum dan setelah fotodegradasi

**LAMPIRAN C**  
**INTENSITAS PUNCAK SPEKTRA FTIR**

**Tabel C.1. Intensitas Puncak Spektra FTIR untuk PET**

| Gugus Fungsi                            | $\lambda$ (Cm-1)      |        |        |                       |        |        |        |        |        | I                     |       |       |                       |        |        |        |       |  |
|---|-----------------------|--------|--------|-----------------------|--------|--------|--------|--------|--------|-----------------------|-------|-------|-----------------------|--------|--------|--------|-------|--|
|   | Sebelum fotodegradasi |        |        | Setelah fotodegradasi |        |        |        |        |        | Sebelum fotodegradasi |       |       | Setelah fotodegradasi |        |        |        |       |  |
|   | PET                   | PET.B  | PET.N  | PET                   |        | PET.B  |        | PET.N  |        | PET                   | PET.B | PET.N | PET                   |        | PET.B  |        | PET.N |  |
|   |                       |        |        | 72 Jam                | 24 Jam | 72 Jam | 24 Jam | 72 Jam | 72 Jam |                       |       |       | 24 Jam                | 72 Jam | 24 Jam | 72 Jam |       |  |
| C=O                                     | 1683,7                | 1683,7 | 1714,6 | 1683,7                | 1685,7 | 1685,7 | 1685,7 | 1685,7 | 0,789  | 0,788                 | 1,034 | 0,636 | 0,658                 | 0,932  | 0,642  | 0,910  |       |  |
| C-O                                     | 1259,4                | 1259,4 | 1267,1 | 1259,4                | -      | -      | 1261,4 | 1261,4 | 0,795  | 0,762                 | 1,035 | 0,652 | -                     | -      | 0,674  | 0,921  |       |  |
|   | 1016,4                | 1016,4 | 1018,3 | 1022,2                | 1016,4 | 1016,4 | 1018,3 | 1018,3 | 0,797  | 0,739                 | 1,035 | 0,627 | 0,638                 | 0,193  | 0,677  | 0,917  |       |  |
|   | 1616,2                | 1616,2 | 1614,3 | 1612,4                | 1616,2 | 1612,4 | 1614,3 | 1616,2 | 0,647  | 0,715                 | 0,572 | 0,580 | 0,622                 | 0,871  | 0,616  | 0,877  |       |  |
| C=C Aromatik                            | 1577,7                | 1577,7 | 1577,7 | 1577,7                | 1577,7 | 1577,7 | 1577,7 | 1577,7 | 0,742  | 0,767                 | 0,713 | 0,645 | 0,658                 | 0,919  | 0,633  | 0,905  |       |  |
|   | 1506,3                | 1508,2 | 1504,4 | 1508,2                | 1508,2 | 1508,2 | 1506,3 | 1508,2 | 0,789  | 0,793                 | 0,836 | 0,649 | 0,681                 | 0,932  | 0,628  | 0,919  |       |  |
| -(CH <sub>2</sub> ) <sub>n</sub> Etilen | 738,7                 | 723,3  | 727,1  | 723,3                 | 738,7  | 734,8  | 740,6  | 740,6  | 0,692  | 0,783                 | 1,047 | 0,654 | 0,625                 | 0,903  | 0,588  | 0,853  |       |  |
|   | 2962,5                | 2962,5 | 2962,5 | 2962,5                | 2962,5 | 2962,5 | 2964,4 | 2962,2 | 0,732  | 0,743                 | 0,739 | 0,626 | 0,653                 | 0,899  | 0,623  | 0,879  |       |  |
|   | 2891,1                | 2891,1 | 2891,1 | 2891,1                | 2891,1 | 2891,1 | 2891,1 | 2891,1 | 0,547  | 0,551                 | 0,533 | 0,516 | 0,588                 | 0,796  | 0,573  | 0,816  |       |  |
|   | 974,0                 | 972,1  | 972,1  | 974,0                 | 974,0  | 974,0  | 979,8  | 977,8  | 0,689  | 0,742                 | 0,754 | 0,608 | 0,626                 | 0,907  | 0,619  | 0,861  |       |  |

Keterangan :

PET : PET tanpa aditif

PET.B : PET beraditif benzofenon

PET.N : PET beraditif naftalen

$\lambda$  : panjang gelombang

I : intensitas