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ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



**Appendices**

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



## Appendix A

### Raw Data of Tensile Properties of PET-Yarns

Figure A-1. Example of load-elongation curve of PET-yarn (the figure shows results of nontreated yarns)

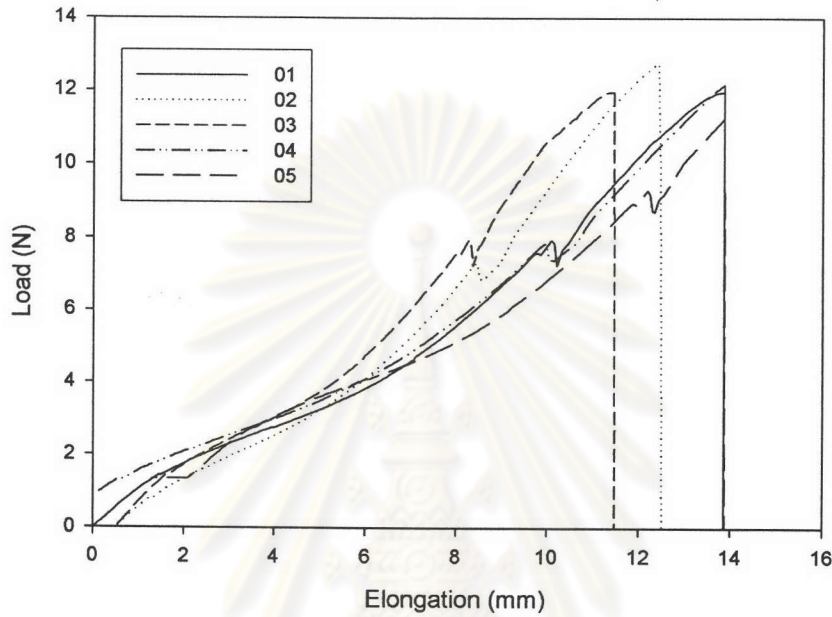


Table A-1 Raw data of maximum load (N) of PET yarns before and after 2 minutes treatments

| Sample No.   | Treatment regimes |                |                |                |                     |                                 |
|--------------|-------------------|----------------|----------------|----------------|---------------------|---------------------------------|
|              | nontreated        | N <sub>2</sub> | Air            | O <sub>2</sub> | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 12.5448           | 12.6545        | 12.4786        | 13.1651        | 13.4987             | 11.6423                         |
| 2            | 12.0154           | 12.4544        | 12.7984        | 12.1648        | 13.1454             | 12.3563                         |
| 3            | 13.5687           | 12.1569        | 12.4646        | 13.4984        | 12.4654             | 13.5687                         |
| 4            | 12.7545           | 12.4845        | 14.0165        | 11.4846        | 12.6699             | 12.7556                         |
| 5            | 13.8548           | 12.4856        | 13.1487        | 10.8996        | 12.8956             | 13.8548                         |
| <b>Means</b> | <b>12.9468</b>    | <b>12.4470</b> | <b>12.9813</b> | <b>12.2424</b> | <b>12.9350</b>      | <b>12.8340</b>                  |
| <b>S.D.</b>  | <b>.7548</b>      | <b>.1803</b>   | <b>.6429</b>   | <b>1.0969</b>  | <b>.4045</b>        | <b>.9004</b>                    |

Table A-2 Raw data of maximum load (N) of PET yarns before and after 5 minutes treatments

| Sample No.   | Treatment regimes |                  |                  |                  |                     |                                 |
|--------------|-------------------|------------------|------------------|------------------|---------------------|---------------------------------|
|              | nontreated        | N <sub>2</sub>   | Air              | O <sub>2</sub>   | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 12.5448           | 12.454310        | 12.498480        | 12.479875        | 12.198474           | 12.498478                       |
| 2            | 12.0154           | 13.498460        | 12.458465        | 12.496498        | 13.440000           | 12.979840                       |
| 3            | 13.5687           | 12.758961        | 13.465498        | 13.187498        | 13.021546           | 13.498490                       |
| 4            | 12.7545           | 11.640000        | 12.654584        | 12.478000        | 13.165156           | 13.498748                       |
| 5            | 13.8548           | 12.356383        | 12.454464        | 12.798460        | 12.164000           | 13.145416                       |
| <b>Means</b> | <b>12.9468</b>    | <b>12.541623</b> | <b>12.706298</b> | <b>12.688066</b> | <b>12.797835</b>    | <b>13.124194</b>                |
| <b>S.D.</b>  | <b>.7548</b>      | <b>.674098</b>   | <b>.432172</b>   | <b>.310560</b>   | <b>.582737</b>      | <b>.416292</b>                  |



**Table A-3** Raw data of maximum load (N) of PET yarns before and after 10 minutes treatments

| Sample No.   | Treatment regimes |                  |                  |                  |                     |                                 |
|--------------|-------------------|------------------|------------------|------------------|---------------------|---------------------------------|
|              | nontreated        | N <sub>2</sub>   | Air              | O <sub>2</sub>   | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 12.5448           | 12.457469        | 12.456500        | 12.654984        | 12.498460           | 12.664300                       |
| 2            | 12.0154           | 12.464960        | 12.469465        | 12.498798        | 12.169489           | 12.642389                       |
| 3            | 13.5687           | 12.464600        | 13.498465        | 12.465410        | 12.449900           | 12.465300                       |
| 4            | 12.7545           | 14.016500        | 11.484600        | 12.669960        | 12.141549           | 12.464530                       |
| 5            | 13.8548           | 13.148740        | 10.899694        | 12.895689        | 12.644870           | 12.486000                       |
| <b>Means</b> | <b>12.9468</b>    | <b>12.910454</b> | <b>12.161745</b> | <b>12.636968</b> | <b>12.380854</b>    | <b>12.544504</b>                |
| <b>S.D.</b>  | <b>.7548</b>      | <b>.686033</b>   | <b>1.002458</b>  | <b>.170933</b>   | <b>.218085</b>      | <b>.100030</b>                  |

**Table A-4** Raw data of elongation at break (mm) of PET yarns before and after 2 minutes treatments

| Sample No.   | Treatment regimes |                  |                  |                  |                     |                                 |
|--------------|-------------------|------------------|------------------|------------------|---------------------|---------------------------------|
|              | nontreated        | N <sub>2</sub>   | Air              | O <sub>2</sub>   | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 12.421542         | 13.545600        | 13.164545        | 13.415874        | 13.149860           | 13.125746                       |
| 2            | 13.265559         | 12.468435        | 13.463196        | 13.454967        | 14.025462           | 13.165646                       |
| 3            | 12.465460         | 12.484231        | 12.476365        | 13.696347        | 13.745460           | 12.784676                       |
| 4            | 14.055469         | 13.476940        | 13.037485        | 13.876640        | 13.154650           | 12.185456                       |
| 5            | 13.566673         | 13.484600        | 13.456797        | 12.746645        | 13.185416           | 12.184646                       |
| <b>Means</b> | <b>13.154940</b>  | <b>13.091961</b> | <b>13.119678</b> | <b>13.438095</b> | <b>13.452170</b>    | <b>12.689234</b>                |
| <b>S.D.</b>  | <b>.708161</b>    | <b>.562646</b>   | <b>.404436</b>   | <b>.429505</b>   | <b>.407968</b>      | <b>.483482</b>                  |

**Table A-5** Raw data of elongation at break (mm) of PET yarns before and after 5 minutes treatments

| Sample No.   | Treatment regimes |                  |                  |                  |                     |                                 |
|--------------|-------------------|------------------|------------------|------------------|---------------------|---------------------------------|
|              | nontreated        | N <sub>2</sub>   | Air              | O <sub>2</sub>   | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 12.421542         | 11.785640        | 12.456460        | 13.966546        | 13.454646           | 13.854654                       |
| 2            | 13.265559         | 12.545465        | 13.456465        | 13.475660        | 12.778890           | 12.678979                       |
| 3            | 12.465460         | 13.785460        | 13.748460        | 13.754685        | 12.322650           | 13.663499                       |
| 4            | 14.055469         | 13.452586        | 12.454695        | 12.954690        | 13.114646           | 13.564240                       |
| 5            | 13.566673         | 13.155465        | 13.664990        | 12.754680        | 12.445567           | 12.484654                       |
| <b>Means</b> | <b>13.154940</b>  | <b>12.944923</b> | <b>13.156214</b> | <b>13.381252</b> | <b>12.823280</b>    | <b>13.249205</b>                |
| <b>S.D.</b>  | <b>.708161</b>    | <b>.792473</b>   | <b>.648372</b>   | <b>.516111</b>   | <b>.468718</b>      | <b>.621923</b>                  |

**Table A-6** Raw data of elongation at break (mm) of PET yarns before and after 10 minutes treatments

| Sample No.   | Treatment regimes |                  |                  |                  |                     |                                 |
|--------------|-------------------|------------------|------------------|------------------|---------------------|---------------------------------|
|              | nontreated        | N <sub>2</sub>   | Air              | O <sub>2</sub>   | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 12.421542         | 12.032132        | 12.121313        | 13.659880        | 13.021494           | 13.498487                       |
| 2            | 13.265559         | 13.965465        | 12.489547        | 13.985465        | 14.212147           | 11.485465                       |
| 3            | 12.465460         | 12.454340        | 11.888775        | 12.666655        | 12.336849           | 13.659870                       |
| 4            | 14.055469         | 13.654879        | 13.754647        | 13.298584        | 13.346547           | 13.348465                       |
| 5            | 13.566673         | 13.885587        | 13.184498        | 12.854655        | 12.241847           | 12.648800                       |
| <b>Means</b> | <b>13.154940</b>  | <b>13.198481</b> | <b>12.687756</b> | <b>13.293048</b> | <b>13.031777</b>    | <b>12.928217</b>                |
| <b>S.D.</b>  | <b>.708161</b>    | <b>.892019</b>   | <b>.771933</b>   | <b>.547402</b>   | <b>.806129</b>      | <b>.893971</b>                  |

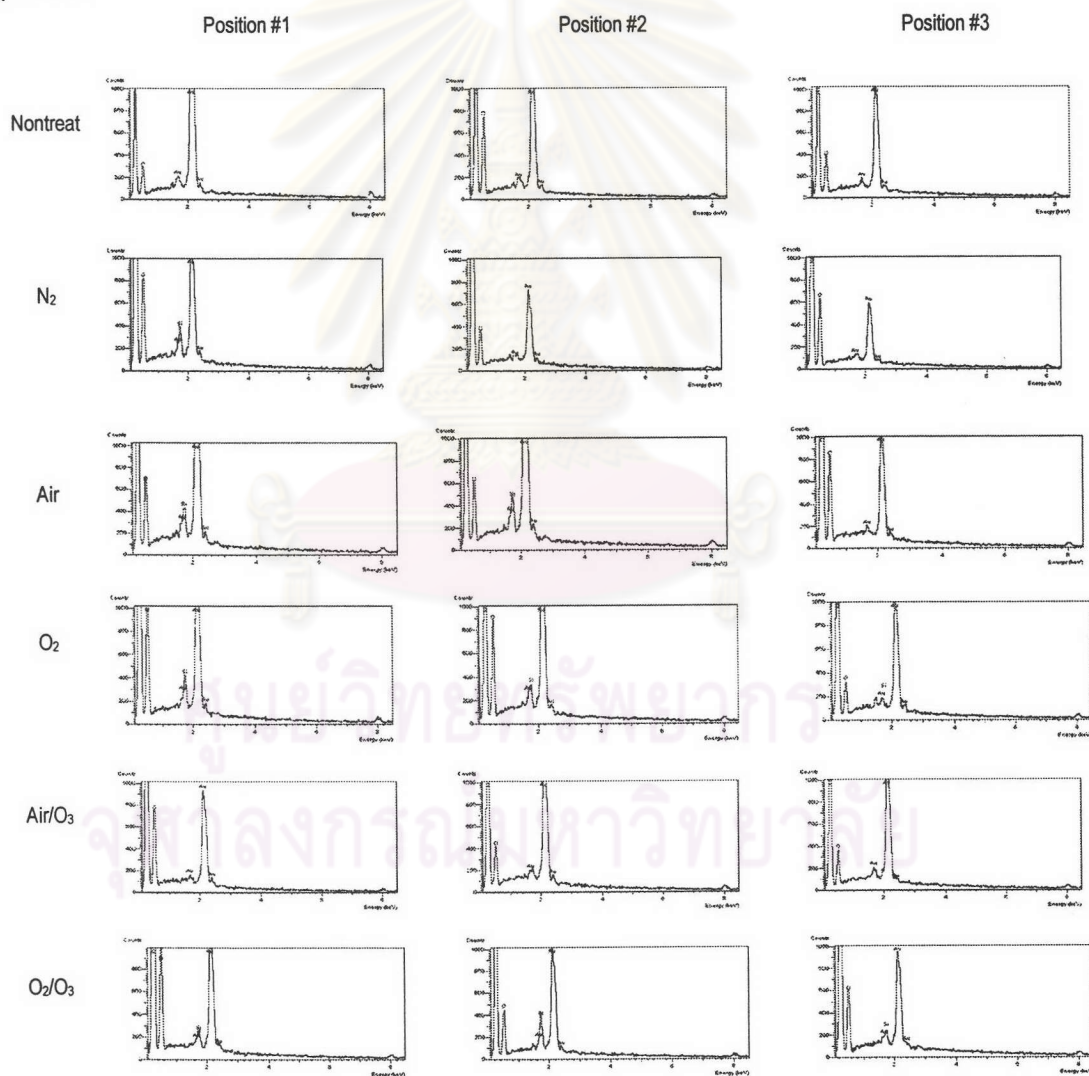
## Appendix B

### Raw Data of EDX Study of PET Fiber

**Table B-1** Raw data of oxygen content of fiber surfaces before and after 10 minutes treatment with different gas species, which was obtained by EDX study (data were reports in % atomic)

| Position.    | Treatment regimes |                |              |                |                     |                                 |
|--------------|-------------------|----------------|--------------|----------------|---------------------|---------------------------------|
|              | nontreat          | N <sub>2</sub> | Air          | O <sub>2</sub> | Air+ O <sub>3</sub> | O <sub>2</sub> + O <sub>3</sub> |
| 1            | 28.78             | 33.26          | 30.25        | 35.42          | 37.05               | 36.46                           |
| 2            | 31.42             | 24.99          | 34.23        | 34.85          | 31.87               | 36.05                           |
| 3            | 29.53             | 32.37          | 37.28        | 31.81          | 34.18               | 37.01                           |
| <b>Means</b> | <b>29.91</b>      | <b>30.20</b>   | <b>33.92</b> | <b>34.02</b>   | <b>34.37</b>        | <b>36.51</b>                    |
| <b>S.D.</b>  | <b>1.36</b>       | <b>4.53</b>    | <b>3.52</b>  | <b>1.94</b>    | <b>2.59</b>         | <b>.48</b>                      |

**Figure B-1** EDX Spectra of PET fiber before and after 10 minutes treatment with different gas species.





## Appendix C

### Raw Data of Tensile Test of the PET/epoxy Composite

Figure C – 1 Stress-elongation curve of neat epoxy

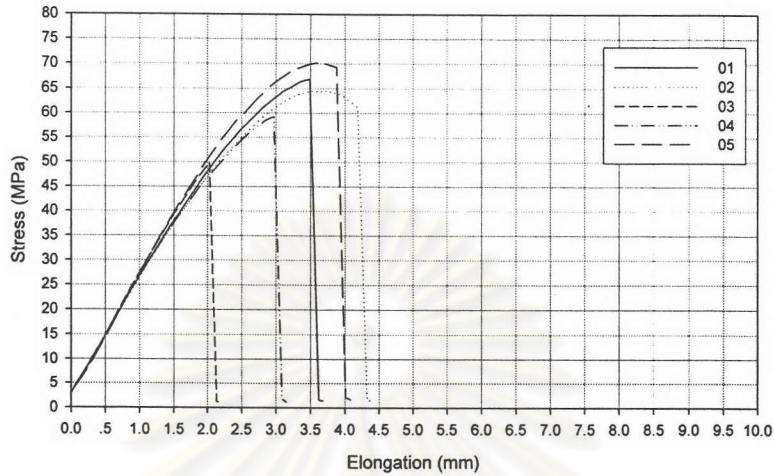


Figure C – 2 Stress-elongation curve of nontreat PET yarn/epoxy composite

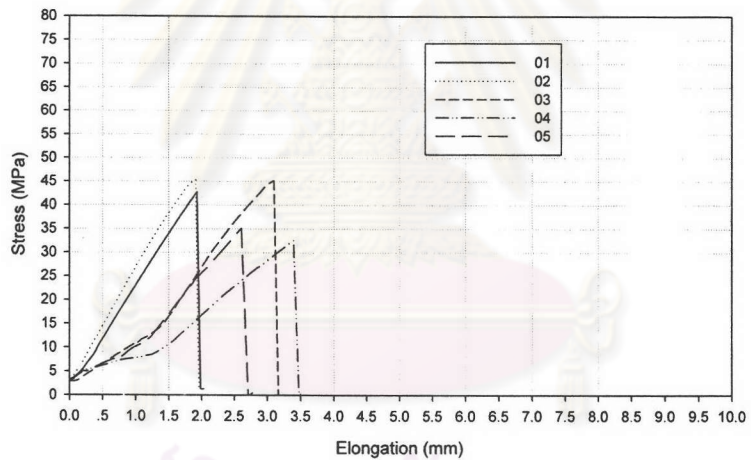


Figure C – 3 Stress-elongation curve of UV/N<sub>2</sub> - 2 minutes treated PET yarn/epoxy composite

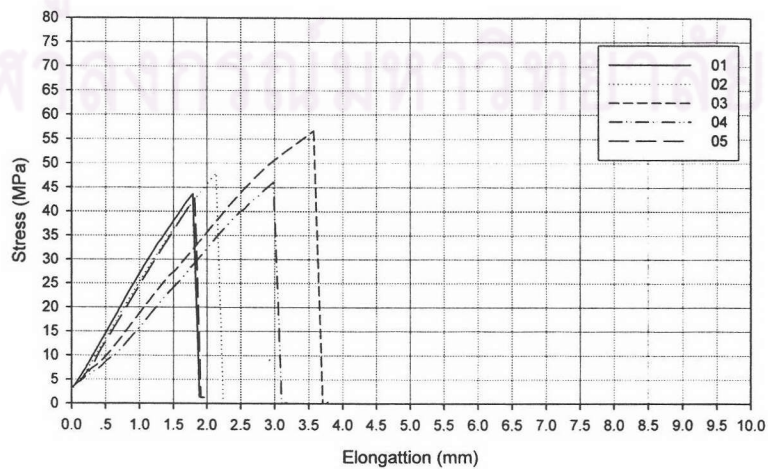




Figure C – 4 Stress-elongation curve of UV/N<sub>2</sub> - 5 minutes treated PET yarn/epoxy composite

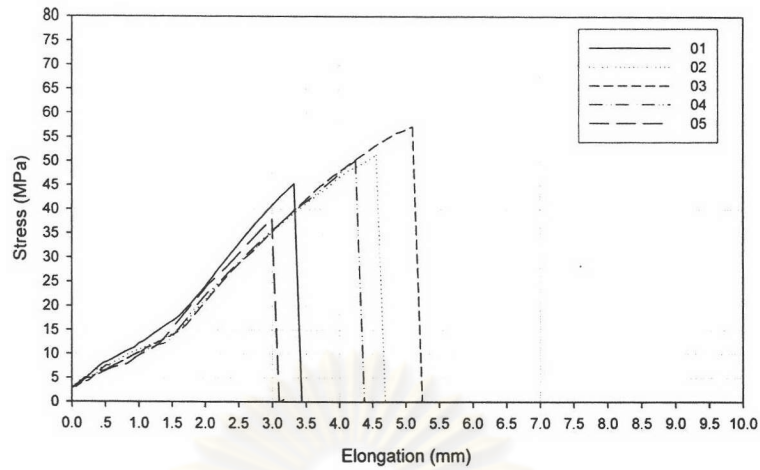


Figure C – 5 Stress-elongation curve of UV/N<sub>2</sub> - 10 minutes treated PET yarn/epoxy composite

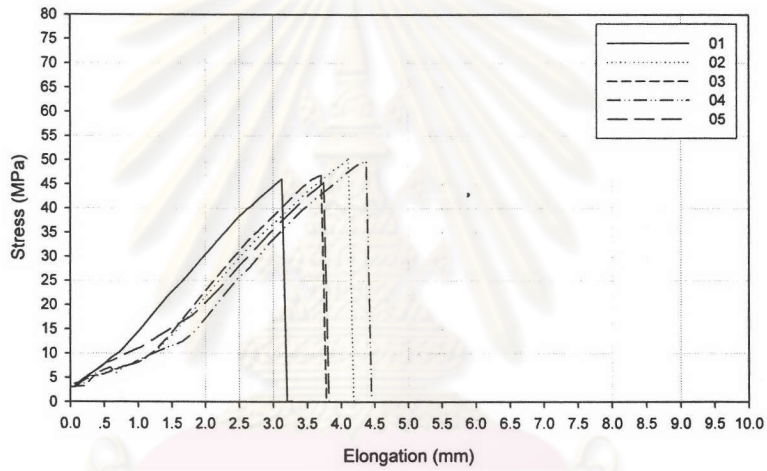


Figure C – 6 Stress-elongation curve of UV/air-2 minutes treated PET yarn/epoxy composite

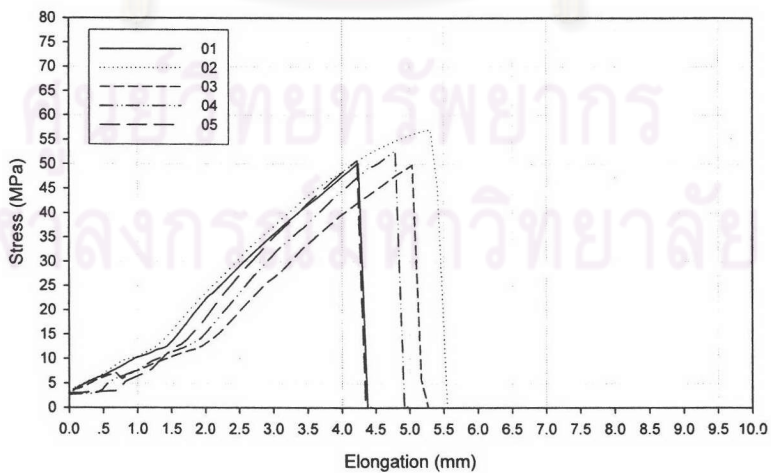


Figure C – 7 Stress-elongation curve of UV/air-5 minutes treated PET yarn/epoxy composite

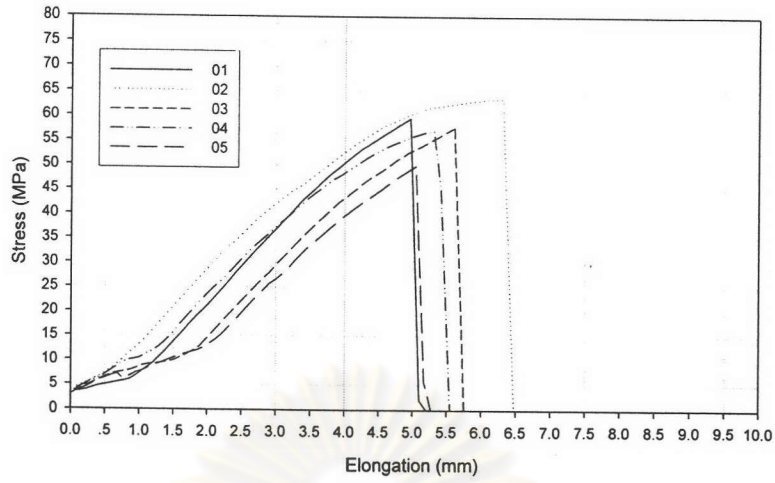


Figure C – 8 Stress-elongation curve of UV/air-10 minutes treated PET yarn/epoxy composite

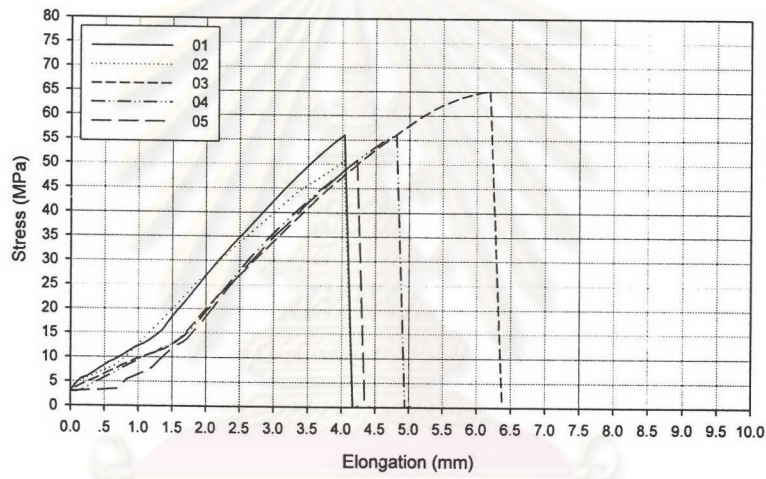


Figure C – 9 Stress-elongation curve of UV/O<sub>2</sub>-02 minutes treated PET yarn/epoxy composite

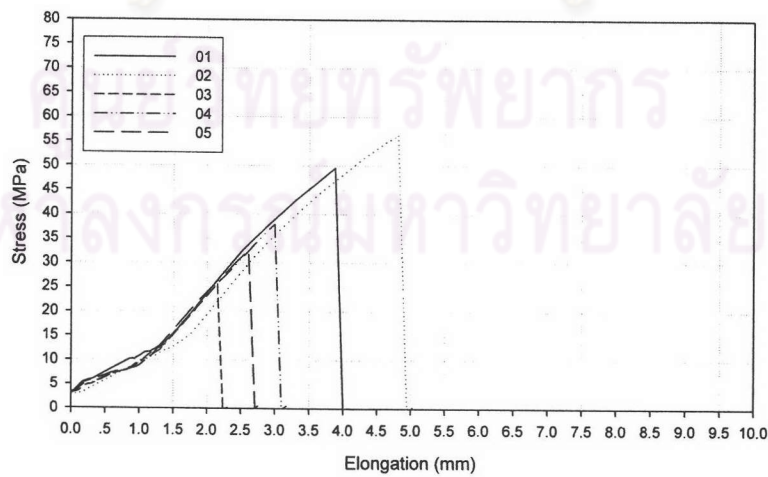


Figure C – 10 Stress-elongation curve of UV/O<sub>2</sub>-05 minutes treated PET yarn/epoxy composite

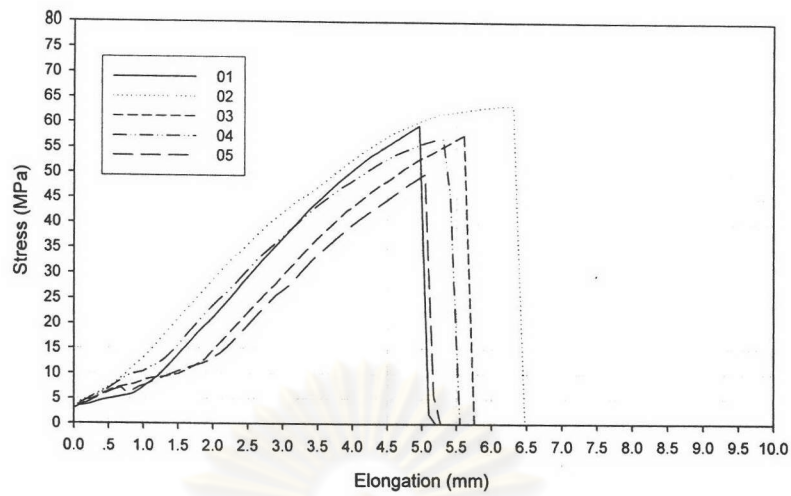


Figure C – 11 Stress-elongation curve of UV/O<sub>2</sub>-10 minutes treated PET yarn/epoxy composite

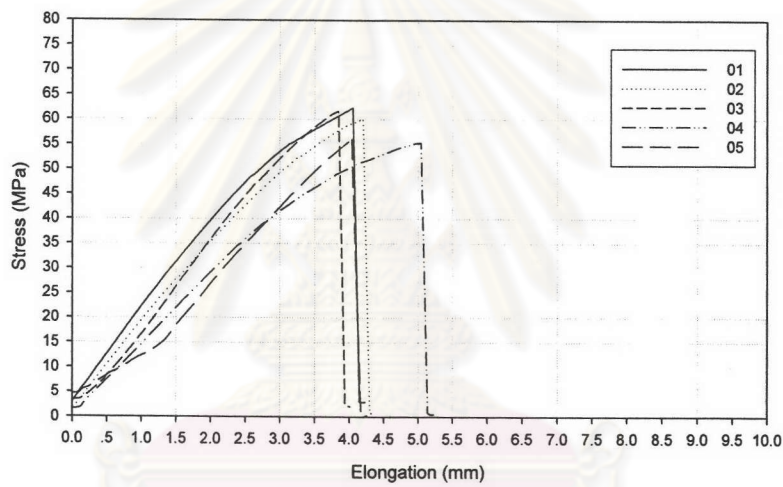
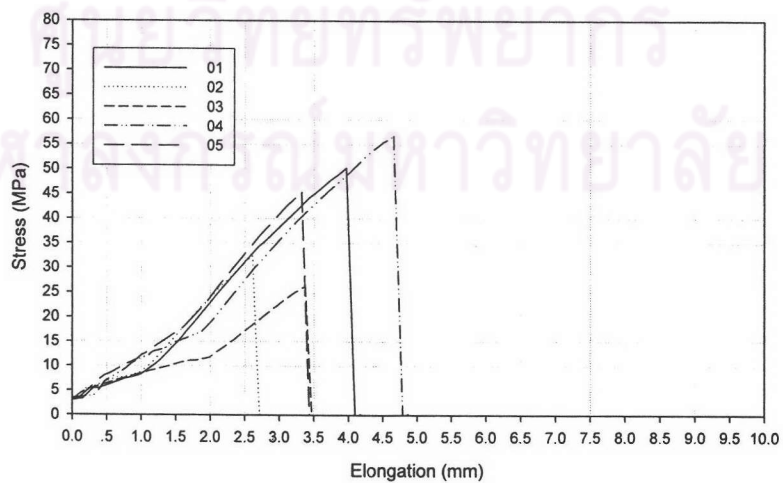
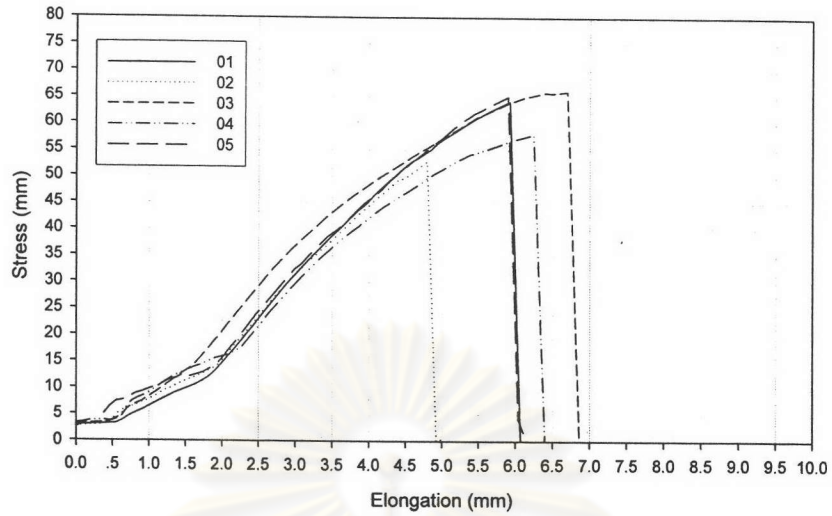


Figure C – 12 Stress-elongation curve of UV/air+O<sub>3</sub> - 2 minutes treated PET yarn/epoxy composite

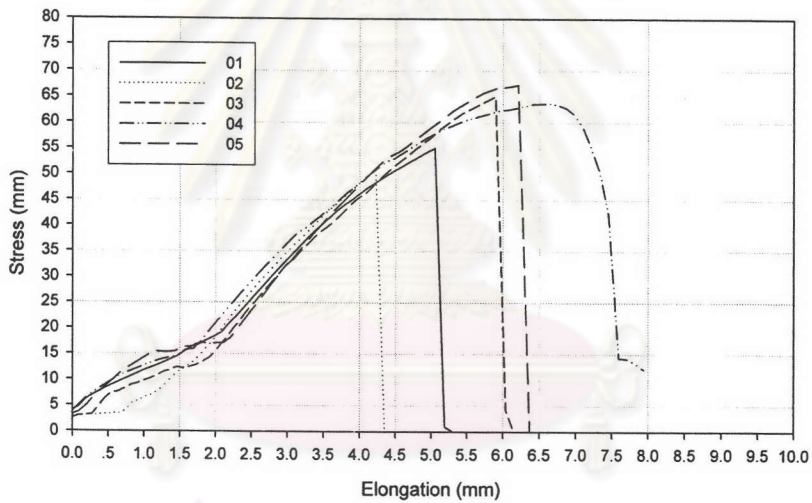




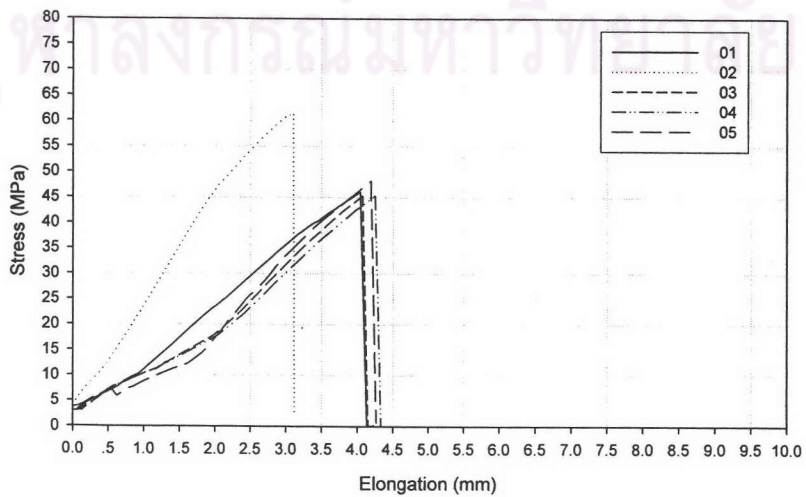
**Figure C – 13** Stress-elongation curve of UV/air+O<sub>3</sub> - 5 minutes treated PET yarn/epoxy composite



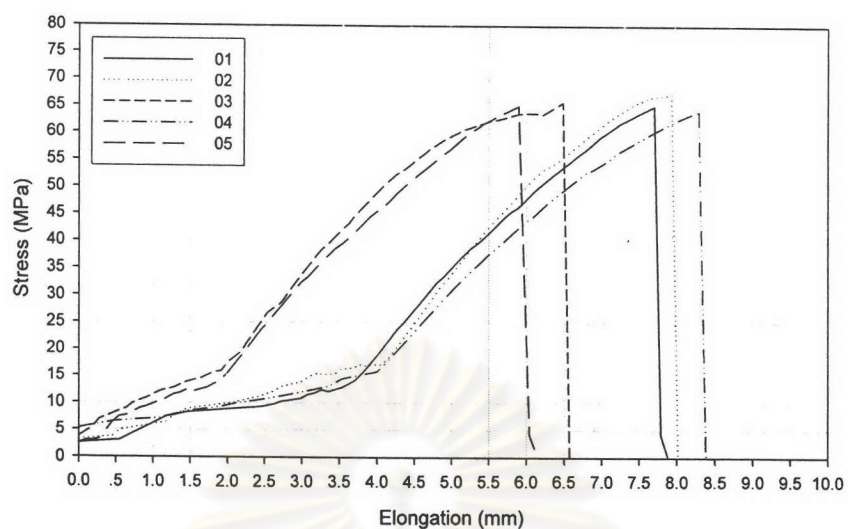
**Figure C – 14** Stress-elongation curve of UV/air+O<sub>3</sub> - 10 minutes treated PET yarn/epoxy composite



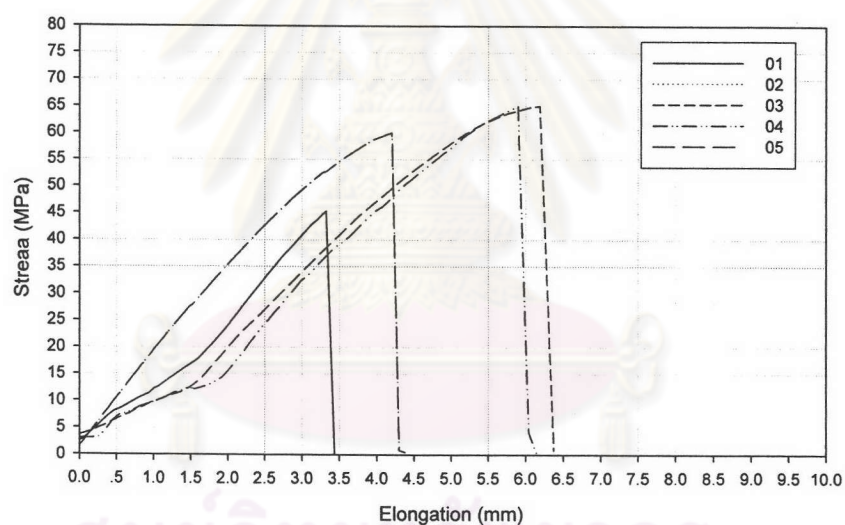
**Figure C – 15** Stress-elongation curve of UVO<sub>2</sub>+O<sub>3</sub> - 02 minutes treated PET yarn/epoxy composite



**Figure C – 16** Stress-elongation curve of UVO<sub>2</sub>+O<sub>3</sub> - 5 minutes treated PET yarn/epoxy composite



**Figure C – 17** Stress-elongation curve of UVO<sub>2</sub>+O<sub>3</sub> - 10 minutes treated PET yarn/epoxy composite



**Table C – 1** Raw data of ultimate tensile strength, elongation to break, and toughness of neat epoxy

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 66.876300              | 3.684400                 | 14.532810        |
| 2            | 64.491900              | 4.402800                 | 18.653360        |
| 3            | 49.923600              | 2.193400                 | 5.804159         |
| 4            | 59.227500              | 3.150400                 | 10.800150        |
| 5            | 70.158100              | 4.086400                 | 17.545988        |
| <b>Means</b> | <b>62.135480</b>       | <b>3.503480</b>          | <b>13.467293</b> |
| <b>S.D.</b>  | <b>7.905329</b>        | <b>.869235</b>           | <b>5.256036</b>  |

**Table C – 2** Raw data of ultimate tensile strength, elongation to break, and toughness of nontreat PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                 |
|--------------|------------------------|--------------------------|-----------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)   |
| 1            | 42.803145              | 2.034102                 | 4.406273        |
| 2            | 45.353358              | 1.958718                 | 4.942101        |
| 3            | 45.211848              | 3.170134                 | 6.610515        |
| 4            | 32.555845              | 3.560686                 | 5.343476        |
| 5            | 35.079181              | 2.775957                 | 4.403516        |
| <b>Means</b> | <b>40.200675</b>       | <b>2.699919</b>          | <b>5.141176</b> |
| <b>S.D.</b>  | <b>5.981387</b>        | <b>.700089</b>           | <b>.911556</b>  |

**Table C – 3** Raw data of ultimate tensile strength, elongation to break, and toughness of 2 minutes UV/N<sub>2</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                 |
|--------------|------------------------|--------------------------|-----------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)   |
| 1            | 43.689000              | 1.935900                 | 4.490240        |
| 2            | 48.018000              | 2.293300                 | 5.867780        |
| 3            | 56.654300              | 3.778900                 | 11.548106       |
| 4            | 46.149200              | 3.176000                 | 7.475171        |
| 5            | 42.803100              | 1.958700                 | 4.278925        |
| <b>Means</b> | <b>47.462720</b>       | <b>2.628560</b>          | <b>6.732044</b> |
| <b>S.D.</b>  | <b>5.533350</b>        | <b>.816067</b>           | <b>2.980651</b> |

**Table C – 4** Raw data of ultimate tensile strength, elongation to break, and toughness of 5 minutes UV/N<sub>2</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 45.383500              | 3.438200                 | 7.431165         |
| 2            | 51.345100              | 4.773900                 | 12.245723        |
| 3            | 57.253300              | 5.334700                 | 15.413300        |
| 4            | 56.216200              | 4.454100                 | 10.705800        |
| 5            | 37.949800              | 3.170100                 | 5.463380         |
| <b>Means</b> | <b>49.629580</b>       | <b>4.234200</b>          | <b>10.251874</b> |
| <b>S.D.</b>  | <b>8.045094</b>        | <b>.910585</b>           | <b>3.927718</b>  |

**Table C – 5** Raw data of ultimate tensile strength, elongation to break, and toughness of 10 minutes UV/N<sub>2</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                 |
|--------------|------------------------|--------------------------|-----------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)   |
| 1            | 46.149200              | 3.277100                 | 7.600100        |
| 2            | 50.300200              | 4.267300                 | 10.021700       |
| 3            | 46.914200              | 3.778900                 | 8.323600        |
| 4            | 49.788600              | 4.454100                 | 10.374900       |
| 5            | 45.383500              | 3.819500                 | 8.524500        |
| <b>Means</b> | <b>47.707140</b>       | <b>3.919380</b>          | <b>8.968960</b> |
| <b>S.D.</b>  | <b>2.208601</b>        | <b>.460762</b>           | <b>1.180333</b> |



**Table C – 6** Raw data of ultimate tensile strength, elongation to break, and toughness of 2 minutes UV/air treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 50.216200              | 4.454100                 | 10.705807        |
| 2            | 56.995100              | 5.553100                 | 17.520510        |
| 3            | 49.788600              | 5.272700                 | 11.954200        |
| 4            | 52.786000              | 5.004000                 | 11.937987        |
| 5            | 50.738900              | 4.427000                 | 9.858922         |
| <b>Means</b> | <b>52.104960</b>       | <b>4.942180</b>          | <b>12.395485</b> |
| <b>S.D.</b>  | <b>2.965482</b>        | <b>.497474</b>           | <b>2.998295</b>  |

**Table C – 7** Raw data of ultimate tensile strength, elongation to break, and toughness of 5 minutes UV/air treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 60.075000              | 5.197300                 | 14.919000        |
| 2            | 63.434000              | 6.475400                 | 25.501570        |
| 3            | 57.630000              | 5.758100                 | 16.705000        |
| 4            | 56.995100              | 5.553100                 | 17.201400        |
| 5            | 49.788600              | 5.272700                 | 11.954200        |
| <b>Means</b> | <b>57.584540</b>       | <b>5.651320</b>          | <b>17.256234</b> |
| <b>S.D.</b>  | <b>5.038471</b>        | <b>.512261</b>           | <b>5.046451</b>  |

**Table C – 8** Raw data of ultimate tensile strength, elongation to break, and toughness of 10 minutes UV/air treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 56.054300              | 4.253500                 | 11.683190        |
| 2            | 50.684900              | 6.761100                 | 11.174323        |
| 3            | 65.085600              | 6.376500                 | 22.078250        |
| 4            | 56.234900              | 5.029100                 | 13.546950        |
| 5            | 50.738900              | 4.427000                 | 9.858900         |
| <b>Means</b> | <b>55.759720</b>       | <b>5.369440</b>          | <b>13.668323</b> |
| <b>S.D.</b>  | <b>5.878925</b>        | <b>1.140201</b>          | <b>4.884007</b>  |

**Table C – 9** Raw data of ultimate tensile strength, elongation to break, and toughness of 2 minutes UV/O<sub>2</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                 |
|--------------|------------------------|--------------------------|-----------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)   |
| 1            | 49.564500              | 4.079900                 | 9.725400        |
| 2            | 56.234900              | 5.029100                 | 13.546900       |
| 3            | 25.630800              | 2.301600                 | 2.664300        |
| 4            | 37.949800              | 3.170100                 | 5.463300        |
| 5            | 32.555800              | 2.776000                 | 4.171100        |
| <b>Means</b> | <b>40.387160</b>       | <b>3.471340</b>          | <b>7.114200</b> |
| <b>S.D.</b>  | <b>12.453870</b>       | <b>1.088519</b>          | <b>4.454967</b> |

**Table C – 10** Raw data of ultimate tensile strength, elongation to break, and toughness of 5 minutes UV/O<sub>2</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 66.637100              | 4.989600                 | 18.626260        |
| 2            | 60.074300              | 4.376200                 | 14.972250        |
| 3            | 41.435500              | 3.664200                 | 7.215260         |
| 4            | 51.870900              | 3.821500                 | 10.529800        |
| 5            | 68.322700              | 4.642600                 | 16.826534        |
| <b>Means</b> | <b>57.668100</b>       | <b>4.298820</b>          | <b>13.634021</b> |
| <b>S.D.</b>  | <b>11.145157</b>       | <b>.554961</b>           | <b>4.683538</b>  |

**Table C – 11** Raw data of ultimate tensile strength, elongation to break, and toughness of 10 minutes UV/O<sub>2</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 63.389300              | 4.229300                 | 15.565000        |
| 2            | 60.074300              | 4.376200                 | 14.972300        |
| 3            | 61.721900              | 4.010700                 | 13.894700        |
| 4            | 55.350100              | 5.227100                 | 16.952600        |
| 5            | 56.054300              | 4.253500                 | 11.683200        |
| <b>Means</b> | <b>59.317980</b>       | <b>4.419360</b>          | <b>14.613560</b> |
| <b>S.D.</b>  | <b>3.511487</b>        | <b>.470357</b>           | <b>1.975399</b>  |

**Table C – 12** Raw data of ultimate tensile strength, elongation to break, and toughness of 2 minutes UV/air + O<sub>3</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                 |
|--------------|------------------------|--------------------------|-----------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)   |
| 1            | 50.300200              | 4.172500                 | 9.812740        |
| 2            | 32.555800              | 2.776000                 | 4.710855        |
| 3            | 26.287300              | 3.543700                 | 4.425800        |
| 4            | 56.756900              | 4.870400                 | 13.048870       |
| 5            | 45.383500              | 3.438200                 | 7.431100        |
| <b>Means</b> | <b>42.256740</b>       | <b>3.760160</b>          | <b>7.885873</b> |
| <b>S.D.</b>  | <b>12.588286</b>       | <b>.794000</b>           | <b>3.627293</b> |

**Table C – 13** Raw data of ultimate tensile strength, elongation to break, and toughness of 5 minutes UV/air + O<sub>3</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 64.169600              | 6.166800                 | 18.784557        |
| 2            | 52.786000              | 5.004000                 | 11.937987        |
| 3            | 66.078000              | 6.862800                 | 25.524080        |
| 4            | 57.937300              | 6.397800                 | 19.086890        |
| 5            | 65.088100              | 6.144200                 | 19.365500        |
| <b>Means</b> | <b>61.211800</b>       | <b>6.115120</b>          | <b>18.939803</b> |
| <b>S.D.</b>  | <b>5.682663</b>        | <b>.685025</b>           | <b>4.811577</b>  |



**Table C – 14** Raw data of ultimate tensile strength, elongation to break, and toughness of 10 minutes UV/air + O<sub>3</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 55.051400              | 5.289000                 | 14.680768        |
| 2            | 50.738900              | 4.427000                 | 9.858900         |
| 3            | 65.088100              | 6.144200                 | 19.365500        |
| 4            | 63.723500              | 7.938700                 | 30.566470        |
| 5            | 67.298100              | 6.371300                 | 22.581600        |
| <b>Means</b> | <b>60.380000</b>       | <b>6.034040</b>          | <b>19.410648</b> |
| <b>S.D.</b>  | <b>7.116005</b>        | <b>1.312562</b>          | <b>7.875865</b>  |

**Table C – 15** Raw data of ultimate tensile strength, elongation to break, and toughness of 2 minutes UV/O<sub>2</sub> + O<sub>3</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                 |
|--------------|------------------------|--------------------------|-----------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)   |
| 1            | 46.149245              | 4.232133                 | 9.870144        |
| 2            | 61.482776              | 3.120000                 | 10.957109       |
| 3            | 45.383518              | 4.153201                 | 8.874338        |
| 4            | 45.383518              | 4.335035                 | 9.371089        |
| 5            | 48.242534              | 4.267261                 | 9.497921        |
| <b>Means</b> | <b>49.328318</b>       | <b>4.021526</b>          | <b>9.714120</b> |
| <b>S.D.</b>  | <b>6.894548</b>        | <b>.508212</b>           | <b>.780866</b>  |

**Table C – 16** Raw data of ultimate tensile strength, elongation to break, and toughness of 5 minutes UV/O<sub>2</sub> + O<sub>3</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 65.088071              | 7.882014                 | 20.458093        |
| 2            | 67.298096              | 8.018310                 | 22.712653        |
| 3            | 65.686469              | 6.574831                 | 23.973176        |
| 4            | 64.169558              | 8.485922                 | 22.936700        |
| 5            | 65.088071              | 6.144185                 | 19.365354        |
| <b>Means</b> | <b>65.466053</b>       | <b>7.421052</b>          | <b>21.889195</b> |
| <b>S.D.</b>  | <b>1.158836</b>        | <b>1.006184</b>          | <b>1.906315</b>  |

**Table C – 17** Raw data of ultimate tensile strength, elongation to break, and toughness of 10 minutes UV/O<sub>2</sub> + O<sub>3</sub> treated PET yarn/epoxy composites

| Sample No.   | Tensile Properties     |                          |                  |
|--------------|------------------------|--------------------------|------------------|
|              | Tensile Strength (MPa) | Elongation to break (mm) | Toughness (J)    |
| 1            | 45.383518              | 3.438190                 | 7.431090         |
| 2            | 60.074279              | 4.298307                 | 14.992267        |
| 3            | 65.085609              | 6.376538                 | 22.104888        |
| 4            | 65.088071              | 6.144185                 | 19.365354        |
| 5            | 60.074279              | 4.376189                 | 14.997312        |
| <b>Means</b> | <b>59.141151</b>       | <b>4.926682</b>          | <b>15.778182</b> |
| <b>S.D.</b>  | <b>8.088825</b>        | <b>1.274549</b>          | <b>5.563191</b>  |



## Vita

Paisan Khanchaitit was born in Chiangmai, Thailand on June 13th, 1978. He received B.Eng. in Chemical Engineering from Kasetsart University, Bangkok, Thailand, in 2000. He joined the Applied Polymer Science and Textile Technology Department of Materials Science Chulalongkorn University in 2000, under the supervision of Assistant Professor Duangdao Aht-Ong. He will graduate in the fall of 2004.



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